Understanding the Influences on Employee Motivation for Lean: An Individual-level Analysis

by

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A Thesis Submitted in Fulfilment of the Requirements for the Degree of Doctor of Philosophy of Cardiff University

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June 2008

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Abstract

It has been widely argued that employee motivation is critical for successful Lean implementation, yet scant research has investigated the individual-level influences on employee motivation for Lean. The primary purpose of the present research is to explore employee beliefs about adopting Lean behaviours (LBs) such as suggestion-making and problem-solving; and the efficacy of a well-established psychological model of behaviour, the Theory of Planned Behaviour (TPB, Ajzen, 1991), to explain employees' intentions to adopt, and their future engagement in, LBs. The impact of a number of individual-level constructs external to the TPB is also considered, including job-related factors (job satisfaction, organisational commitment, Lean self-efficacy, past behaviour, union membership, organisational tenure, employee level) and person-related factors (personality, gender, age). Data (54 face-to-face structured interviews, 3 focus groups with 23 employees, 1030 questionnaires) was collected from employees in four organisations initiating Lean change. Employees generally held positive beliefs about adopting LBs and could see the benefits both for themselves and for their organisation. An average 57.4% of the variance in intentions was explained by attitude, subjective norm and perceived behavioural control (PBC). PBC was a significant predictor of intentions with all four samples; attitude and subjective norm were also significant predictors with the larger samples. Consistently, the non-TPB variables did not predict intentions independently of the TPB variables. Intentions and PBC explained on average 9.6% of the variance in behaviour. Past behaviour, employee level, Lean self-efficacy, job satisfaction, organisational commitment, union membership and neuroticism emerged as significant predictors of behaviour independently of the TPB variables with some of the samples. Personality did not moderate the intentions-behaviour relation and openness was consistently the only personality trait with a significant independent effect on Lean self-efficacy. The thesis discusses the practical implications of the findings for organisations implementing Lean in terms of designing work environments, communication, training and the use of personality inventories for recruitment. Limitations of the study and appropriate directions for future research are explored.

Acknowledgements

Although the thesis represents my own work, there are a number of people who I would like to thank:

- My supervisors, Professor Tony Manstead and Professor Peter Hines, for their guidance, continued support and constructive comments throughout the PhD.
- The four organisations (Rizla, Ivax, Arvin Meritor and Cardiff University) for granting me access to their employees.
- All the people who participated in the interviews, focus groups and questionnaires.
- The Engineering and Physical Sciences Research Council for providing funding for the research.
- My colleagues at Cardiff University's Innovative Manufacturing Research Centre, particularly Dr Andy Davies and Professor Mo Naim, for allowing me the time to write up the PhD.
- My family (Liz Beale, Ken Beale, Melanie Beale and Mary Andrews) for their emotional and financial support throughout my education, without which I would not have been in a position to undertake the PhD.
- Kathryn Anne Cooke for her remarkable patience and unconditional support throughout the PhD – a true star! The PhD is dedicated to Kathryn.

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Abbreviations and Glossary

Abbreviation	Full title	Definition
Arvin	Arvin Meritor	One of the participating organisations
BFI	Big Five Inventory	Measure of personality used in current study
BOS	Bristol Online Survey	Online survey tool used in current study
CAW	Canadian Auto Workers	Canadian Auto Workers (a trade union)
CI	Continuous Improvement	Business improvement technique characterised by a constant effort to improve processes and performance
CU	Cardiff University	One of the participating organisations
CUIMRC	Cardiff University Innovative Manufacturing Research Centre	The research centre in which the researcher worked
ELM	Elaboration Likelihood Model	Theoretical model of persuasion and attitude change
FFM	Five Factor Model	Theoretical model of personality
HMRC	Her Majesty's Revenue and Customs	Her Majesty's Revenue and Customs
IMVP	International Motor Vehicle Program	Research project which investigated the manufacturing performance of the global motor industry
JIT	Just-in-time	A pull production system or process driven by actual demand that increases efficiency and decreases waste

LBs	Lean Behaviours	Behaviours that are consistent with, and endorsed by, Lean principles
LPS	Lean Production System	A production system driven by Lean principles
LSE	Lean Self-efficacy	A person's confidence to adopt behaviours that are consistent with, and endorsed by, Lean principles
LU	Lean University	The name of the Lean initiative at Cardiff University
M	Mean	The statistical average
NUMMI	New United Motor Manufacturing, Inc	A joint business venture between Toyota and General Motors
PBC	Perceived Behavioural Control	Perception of how easy or difficult it is to perform a given behaviour (thought to be a product of beliefs about factors that affect control over the behaviour, weighted by their frequency of occurrence)
PCS	Public and Commercial Services	The sixth largest trade union in the United Kingdom
RBSE	Role-breadth self-efficacy	A person's confidence to adopt various proactive, interpersonal, integrative behaviours that fall beyond prescribed technical job requirements
SD	Standard Deviation	A measure of the variability or dispersion of a set of data around the mean
SPSS	Statistical Package for Social Sciences	Statistical package used in the current study to analyse the quantitative data
SUCCESS	Sustainable Channelled Change in Every Scale and Situation	Research project on which the researcher worked

TPB	Theory of Planned Behaviour	Socio-cognitive expectancy-value model used to predict and understand the behavioural choices individuals make. Extension of TRA
TPS	Toyota Production System	Production system implemented at Toyota
TQM	Total Quality Management	Management philosophy that focuses on quality and the elimination of defective products and services
TRA	Theory of Reasoned Action	Socio-cognitive expectancy-value model used to predict and understand the behavioural choices individuals make
UK	United Kingdom	United Kingdom
VIF	Variance Inflation Factor	Statistic that indicates whether a predictor has a strong linear relationship with other predictors

Chapter 1 - Introduction

1.1 Introduction

It has been widely argued that employee motivation is critical for successful Lean implementation of the business improvement initiative know as Lean (Feld, 2000; Radnor & Walley, 2008; Womack, Jones & Roos, 1990). However, scant research has investigated the individual-level influences on employee motivation for Lean. The present research explores employee beliefs about adopting Lean behaviours (such as suggestion-making and problem-solving); and the efficacy of a psychological model of behaviour, the Theory of Planned Behaviour (Ajzen, 1991), to explain employees' intentions to adopt, and their future engagement in, Lean behaviours. The impact of a number of individual-level constructs external to the Theory of Planned Behaviour is also considered, including job-related factors (job satisfaction, organisational commitment, Lean self-efficacy, past behaviour, union membership, organisational tenure, employee level) and person-related factors (personality, gender, age). The research is interdisciplinary, drawing on theories and empirical research from the fields of operations management (Lean in particular), occupational psychology and applied social psychology.

The future of manufacturing in the UK and other similar advanced economies is more at risk today than at any time since the industrial revolution. Low labour cost countries are placing greater pressures on manufacturers in the West to decrease their costs while increasing flexibility, raising quality standards and shortening lead times. To compete successfully in this fierce, global economy and to create responsive and sustainable businesses, many UK manufacturers are implementing Lean, one of the most popular management approaches of the current day.

The term 'Lean production' originates from the work of Womack et al., (1990) and was coined to describe the integrated, process-based manufacturing approach designed by the engineer Ohno (1988) for the Toyota Motor Corporation. Driven by waste elimination, customer value, material/product flow and continuous improvement, Lean production integrates a just-in-time (JIT) approach with

management initiatives such as Total Quality Management (TQM), Business Process Reengineering, continuous improvement and teamworking (Radnor & Boaden, 2008). Lean thinking represents a more advanced evolution of Lean production and concerns the application of Lean to the entire enterprise from shopfloor to office (Womack & Jones, 2003).

One of the most important differences between traditional manufacturing approaches and the Lean approach centres on the behaviours and roles expected of all employees[1] (Krafcik, 1988). Unlike conventional hierarchical command-and-control structures, Lean policies and practices promote the transfer of the maximum number of tasks and responsibilities to the employees actually adding the value, irrespective of their level within the organisation (Womack et al., 1990). Lean reinforces employee empowerment and encourages all workers to become involved in continuous improvement activities aimed at eliminating non-value adding processes (such as suggestion schemes), and to engage in the proactive aspects of work (such as problem-solving, target-setting and decision-making). To enhance organisational performance and to develop employee appreciation for the manufacturing process and for what the customer values, all employees are encouraged to become multi-skilled, to rotate jobs and tasks with colleagues and to engage in cross-functional team-working. The combination of these job facets has led some authors to argue that Lean enhances feelings of responsibility and commitment among workers by creating enriched and challenging jobs based upon a respect for humanity (Monden, 1983; Schonberger, 1982).

Since its advent, Lean has transformed the manufacturing world, demonstrating a remarkable ability to improve the quality, productivity and lead times of manufacturing companies in many different industry sectors (Fujimoto, 1999; Krafcik, 1988; Liker, 2004; Womack et al., 1990; Wood, Stride, Wall, & Clegg, 2004). Lean currently represents, as Womack et al. (1990) predicted, one of the most popular management techniques of the 21st century (Arnheiter & Maleyeff, 2005). Lean thinking has also extended quite considerably into the service sector, where it has been successfully applied to improve healthcare (Kollberg, Dahlgaard &

[1] The terms 'employees', 'workers' and 'staff' will be used interchangeably and, unless stated otherwise, will refer to people working at all levels of the organisation.

Brehmer, 2007; Massey & Williams, 2005), education (Comm & Mathaisel, 2005a, 2005b; Emiliani, 2004a), local government (Krings, Levine, & Wall, 2006), legal services (Hines, Martins & Beale, 2008) and public services in general (Bhatia & Drew, 2006; Radnor, Walley, Stephens & Bucci, 2006; Radnor & Walley, 2008).

Regardless of these success stories, concerns have been raised regarding the extent to which organisations have been able to effectively implement Lean. According to some authors, fewer than 10% of UK organisations have accomplished successful Lean implementation (Baker, 2002; Sohal & Eggleston, 1994). A human resource factor that may account for these failures is the lack of attention paid by organisations to the attitudes of employees participating in the Lean transformation. Many failures in the attempt to implement Lean can be attributable to worker attitudes, and specifically to employees having a fundamental misunderstanding about Lean (Ballé, 2005).

1.2 Employee Motivation for Lean: The Essential, Neglected Ingredient

Given its overwhelming popularity and its ability to enhance organisational performance, there has been a plethora of research looking at Lean business systems in the past 15 years. Most of this research and current Lean practice have, however, tended to be process-driven, focusing on the application of popular tools and techniques (e.g. 5S, Value Stream Mapping) designed to improve business processes. By comparison, there has been little research looking at the human dimensions of Lean (Hines, Holweg & Rich, 2004), especially employee motivation. Although there is a reasonable amount of research on the experiences of employees in Lean organisations and the impact of Lean practices on employee attitudes and well-being (Anderson-Connolly, Grunberg, Greenberg & Moore, 2002; Berggren, 1992; Conti, Angelis, Cooper, Faragher & Gill, 2006; Delbridge, 1995, 2005; Jackson & Mullarkey, 2000; Lewchuk & Robertson, 1996; Parker, 2003; Seppälä & Klemola, 2004), there is scant research on the factors underlying employee motivation to assume a Leaner approach to their work.

This is surprising given that employees represent the "blood and guts" of an organisation (Clarke, 1994) and employee commitment and motivation are essential

for achieving successful implementation of total quality initiatives and organisational change (Antony, Leung, Knowles & Gosh, 2002; Bessant, Kaplinsky & Lamming, 2003; Coyle-Shapiro & Morrow, 2003; Elrod & Tippett, 2002; Guimaraes, 1999; Lowe, Delbridge & Oliver, 1997; Robertson, 1994; Sohal, Samson & Ramsay, 1998; Storseth, 2004; Taira, 1996; Zairi, 2002). Although the organisation provides the external environment in terms of strategy, processes and technology, it is the willingness of employees to adopt behaviours that support appropriate engagement with these organisational facets that determine the extent to which changes are made and organisational objectives achieved. Employees play a critical role in determining organisational competitiveness - "the organization and management of employees, together with their attitudes, are perhaps the most important (and certainly the most idiosyncratic) resource on which productivity and competitive performance ultimately depend" (Turnbull, 1986, p. 203).

There are a number of authors who recognise the importance of employee motivation, commitment and behaviour for successful Lean implementation.

> "..to make this [production] system work at all – a system that ideally produced two hours or less of inventory – Ohno needed both an extremely skilled and motivated work force" (Womack et al., 1990, p. 53).

> "Lean works best if driven by all the people" (Radnor & Walley, 2008, p. 14).

> "Addressing an organisation's culture and the associated personnel behaviour patterns is a critical component of implementing and sustaining Lean" (Sawhney & Chason, 2005, p. 92).

> "In its simplest terms, Lean production has to be a people-driven process, because only the employees can identify ways of improving the existing process or product" (Forrester, 1995, p. 22).

> "For a LPS [Lean Production System] to operate effectively, it appears that a fairly high level of commitment is required from employees..." (Shadur, Rodwell & Bamber, 1995, p. 1408).

> "The success of the [Lean] transformation, while clearly aided by Lean techniques and tools, owes as much to Wiremold's strategy of leveraging its most valuable resource, its people" (Fiume, 2004, p. 32).

> "The practice of Lean Behaviors is shown to be an essential element for producing healthy work environments that can lead to economic growth, as well as help businesses sustain efforts to become Lean producers" (Emiliani, 1998, p. 615).

> "Motivation, tenacity, leadership and direction all play roles in the successful deployment of a Lean program" (Feld, 2000, p. 7).

> "Failure to implement [Lean] changes was reported to be due to a lack of ... commitment from both management and staff" (Radnor et al., 2006, p. 49).

The importance of employee motivation for successful Lean implementation is apparent if the job characteristics endorsed by the Lean approach are considered. To ensure the smooth running of value-adding activities, employees need to be sufficiently motivated to engage proactively with their working environment and continuously to seek ways in which flow could be improved, errors minimised and waste reduced. Motivated and adaptable workers are, according to MacDuffie (1995), an essential ingredient for successful Lean implementation and Barton and Delbridge (2001) even argue that "To recruit and establish a well-motivated workforce that will participate and contribute its discretionary effort, managers need to understand what drives an individual's work performance" (p. 9).

Despite these observations, there is surprisingly little research on the factors underlying this much needed employee motivation for Lean. This could be because

companies in the past have often been reluctant to grant access to researchers interested in employee attitudes toward Lean (Shadur et al., 1995). Alternatively, it could reflect how Lean is conceptualised. Traditionally, it has been defined as a system-level intervention or management philosophy. The work of Deming (1986), for example, stresses that most variation in work performance can be attributed to variations in the system. Consideration of employee attitudes and motivations has tended to be viewed as a distraction from the company's effort to improve performance systematically (Lam & Schaubroeck, 1999). The gap between operations management and social sciences research noted by Van der Zwaan and De Vries (2000) could also explain the limited research in this area.

This lack of research is inconsistent with labour economists who argue that human capital investments (employee skills, values, attitudes and experiences) carry significant economic value for organisations (Boyor & Smith, 2001). The person-environment fit model also states that enhanced performance occurs when an employee's (the person) aspirations, values and skills are aligned with their job (the environment) (Tinsley, 2000).

1.3. Employee Reactions to Lean

Despite limited in-depth research in this area, there are a number of authors who argue that employees tend to react negatively to Lean (Benders, 1996; Berggren, 1993; Delbridge, 1998, 1995; Ezzamel, Willmott & Worthington, 2001; Grönning, 1995; Radnor et al., 2006; Rehder, 1994). One study even reports that a staggering 75% of organisations introducing Lean experience employee resistance, and that this resistance spans from senior management to shopfloor (Sohal et al., 1994). A recent survey completed by nearly 2500 businesspeople worldwide revealed that 27.7% considered employee resistance as the biggest obstacle to Lean implementation at their facility (Lean Enterprise Institute, 2007). When Toyota's suppliers attempted to introduce Lean, they too experienced problems with employees. Commenting on the implementation process, a senior manager explains that "The technical side is the easy side. It's the people side, the culture, the training, how they operate themselves ... that we have had the most difficulty with" (Langfield-Smith & Greenwood, 1998, p. 342).

This resistance could stem from employee beliefs about Lean. Evidence suggests that lower level employees believe that senior management's enthusiasm for Lean reflects their desire to cut the number of staff (Achanga, Shehab, Roy & Nelder, 2006; Turner, 1996). Furthermore, a survey among employees in an organisation undergoing restructuring revealed that 30–40% of employees believed that their jobs would be put at risk in the future by various aspects of restructuring, one of which was Lean (Grunberg, Anderson-Connelly & Greenberg, 2000). Literature has consistently reported links between Lean and job losses and other negative outcomes for employees including work intensification, increased stress and longer working days (Anderson-Connolly et al., 2002; Arnheiter & Maleyeff, 2005; Berggren, 1993; Conti et al., 2006; Delbridge, 1998; Delbridge & Turnbull, 1992; Garrahan & Stewart, 1992; Jackson & Mullarkey, 2000; Kinnie, Hutchninson, Purcell, Rees, Scarbrough & Terr, 1996; Millman, 1996; Parker & Slaughter, 1988a; Skorstad, 1994; Turnbull, 1988; Williams, Haslam, Williams & Johal, 1992). Employees who are aware of these arguments against Lean, perhaps through their own experiences, the experiences of their colleagues/acquaintances, or through the media, are unlikely to be committed to a management approach which could, they believe, threaten their job security and/or working conditions. A large number of organisations are even reluctant to be described as Lean for fears of generating negative employee perceptions and behaviours (Kinnie, Hutchinson & Purcell, 1998). The word 'Lean' itself means little or no fat and an interpretation of this within an organisational context may be job losses and increased pressures for remaining staff. This fundamental misunderstanding about Lean is what Emiliani (2004b) and Womack et al. (1990) argue has prevented so many businesses from realising the full benefits of Lean.

1.4. Broad Objectives and Boundaries of Study

Despite the popularity and clear potential of Lean, the importance of employee motivation, commitment and behaviour for successful Lean implementation, and the widely acclaimed employee resistance to Lean, there is little empirical research on the employee motivational aspects of Lean; specifically the beliefs of employees regarding the outcome of their adoption of Lean behaviours (LBs) and the impact of various individual-level constructs (e.g., job satisfaction, organisational commitment,

attitudes, perceptions) on employee motivation for, and engagement in, LBs. Addressing calls for more multidisciplinary operations management research (Lovejoy, 1998), the current study draws on some illustrative research from the sub-disciplines of operations management, applied social psychology and occupational psychology to explore this important and timely research area by collecting individual-level data from employees in organisations initiating Lean change. Although other sub-disciplines (e.g., Human Resource Management) are recognised as being relevant to the current research, to keep the study focused, attention is paid to research falling within the operations management, applied social psychology and occupational psychology fields. For the purpose of this research, employee motivation is defined as a psychological construct that reflects an employee's internal drive and energy to assume particular behaviours within the workplace.

Because Lean is one of the most popular management techniques of the current day (Arnheiter & Maleyeff, 2005) and because it incorporates approaches including JIT, TQM, continuous improvement, Business Process Re-engineering and teamworking (Kinnie et al., 1998; Radnor & Boaden, 2008), Lean rather than any other management approach will be the direct focus of the current study.

The impact of Lean on employee attitudes such as job satisfaction is beyond the scope of the study because this has been extensively researched elsewhere (Anderson-Connolly et al., 2002; Berggren, 1992; Conti et al., 2006; Delbridge, 1995, 2005; Jackson & Mullarkey, 2000; Lewchuk & Robertson, 1996; Parker, 2003; Seppälä & Klemola, 2004).

Although the importance of different organisational facets such as leadership, strategy, processes and technology in determining employee behaviour is recognised, to keep the research focused, only individual-level, people constructs will be considered. It is not unusual for researchers to investigate employee motivation and behaviour by focusing solely on individual-level constructs (see, for example, Barrick & Mount, 1991; Judge & Ilies, 2002; Neuman & Kickul, 1998; Organ & Ryan, 1995). The decision to adopt an individual–level analysis was based on arguments that most research on promising practices focuses on organisational-level explanations of success or failure and that there is a distinct lack of research looking

at individual-level predictors of employee adoption of promising practices (Leseure, Bauer, Birdi, Neely & Denyer, 2004). According to Coyle-Shapiro and Morrow (2003), more attention should be paid to individual-level issues such as mindsets, behaviours and organisational commitment because they explain more variance in the success or failure of best practice initiatives than organisational constructs. Niepce and Molleman (1998) recognise the relevance of individual-level factors for explaining the various employee responses to Lean; and Radnor (2000) argues that addressing the people aspects of Lean change is particularly important because people support the organisational facets of strategy, process and technology.

1.5. Thesis Structure

The thesis is divided into nine chapters. Following this introductory chapter is the literature review (Chapter 2) which serves to demonstrate knowledge of the relevant literature, to identify research gaps to be addressed and to outline the hypotheses and overarching research questions. The methodology chapter (Chapter 3) reviews philosophical perspectives about research, and provides justifications for the selection of the data collection methods and measures and of the participating organisations. To test the proposed methodology and approach, a pilot was conducted with a sample of employees from a cigarette paper manufacturer. The results from the pilot and any recommendations for the main study are discussed in Chapter 4. Chapters 5, 6 and 7 present the results from the three organisations that participated in the main body of the research. Chapter 8 compares the results from the four samples to determine the overall support for the hypotheses, identifies any commonalties and/or discrepancies in the findings, and discusses the results in relation to past research. Conclusions, practical implications, limitations and areas for future research are explored in Chapter 9.

Chapter 2: Literature Review

2.1. Introduction

This chapter serves to demonstrate knowledge of the relevant literature, to identify research gaps to be addressed and to outline the overarching research questions. The researcher will provide an overview and broad definition of Lean and the key principles driving this management approach, and will discuss how the employee motivational and behavioural aspects of Lean have generally been neglected. The little research on the individual-level factors underlying employee receptiveness to Lean will be critically reviewed through a multidisciplinary research lens, drawing on illustrative studies from the operations management, applied social psychology and occupational psychology literatures. The core theoretical model that will be used to explore employee receptiveness to Lean will be presented and reviewed.

The ontological and epistemological aspects of the study will be discussed in Chapter 3, but suffice to say that a positivistic philosophical position is adopted and hypotheses are generated based on reviews of past theoretical and empirical research. Through the generation and testing of hypotheses, the researcher intends to gain a more holistic understanding of the underlying determinants of employee receptiveness to Lean.

2.2 Overview of Lean

Several authors argue that Lean is a nebulous concept that lacks clear definition (Bartezzaghi, 1999; Bhasin & Burcher, 2006; Papadopoulou & Özbayrak, 2005). Despite this, an attempt will be made to define Lean by drawing on its original conceptualisation and objectives.

Lean production offers an integrated approach that centres on improving processes throughout the operational system by focusing on value, flow, pull and perfection (Womack & Jones, 2003). Its primary goal is the elimination of non-value adding operations to deliver the right quantity and quality of raw materials, subassemblies,

or complete products as and when they are needed by the next stage of the production process or by the customer (Monden, 1994). Unlike traditional mass production systems, Lean supports a customer pull approach in which products are manufactured to meet downstream internal/external customer requirements. Consequently, the production process is characterised by minimal buffers and inventory.

In essence, Lean combines the advantages of craft and mass production while avoiding the high costs associated with the former and the inflexibility associated with the latter (Womack et al., 1990). To produce large volumes of highly varied products, Lean encourages the use of multi-skilled teams across the organisation. *Kaizen* (continuous improvement) is paramount. Lean organisations are driven by an endless quest for perfection in which ways to decrease costs and eliminate waste are constantly sought (Papadopoulou & Özbayrak, 2005). Given the emphasis on continuous improvement, Lean is often described as a journey with no objectively defined destination or state (Kinnie et al., 1996; Rees, Scarbrough & Terry, 1996).

To secure employee commitment, a norm in Japan for organisations implementing Lean is a lifetime employment guarantee for all levels of employees (Liker, 1998). According to Womack et al. (1990), it is a gross violation of Lean to lay people off as a result of process improvement or waste identification activities. Any employee made available should be appropriately redeployed to other parts of the business. This aspect of Lean is, however, rarely translated in the UK (Morris, Lowe & Wilkinson, 1998; Naylor, 2000).

The actual term 'Lean' was popularised by Womack et al. (1990) in their classic book 'The Machine That Changed The World'. This book reports the findings of an extensive five-year research project, the International Motor Vehicle Program (IMVP) (1985-1990), which investigated the manufacturing performance of the global motor industry. The study demonstrated that Japanese manufacturers were producing twice as many cars as their Western counterparts. This impressive performance differential was attributed to Lean production practices in Japan which, according to Womack et al. (1990), led to improved quality and productivity, and a reduction in lead times. The Japanese Toyota Production System (TPS), dating back

to the 1960s, was the most impressive. Despite operating within tight space, time, and inventory constraints, the TPS demonstrated uninterrupted material flow, superior efficiency and reliability, and a remarkable ability to produce high quality cars cost-effectively, with short cycle times and with minimal waste (Monden, 1983; Ohno, 1988; Shingo, 1988). Ohno, the production engineer who designed the TPS, explains that "All we are doing is looking at the timeline from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value-added wastes" (Ohno, 1988, p. 7).

Womack and Jones (2003) describe Lean as a philosophy or 'way of thinking' that, for optimal performance, should be implemented throughout the whole enterprise from shopfloor to office. It offers a mechanism for doing "more and more with less and less – less human effort, less equipment, less time, and less space – while coming closer and closer to providing customers with exactly what they want" (Womack & Jones, 2003, p. 15). Lean can be conceptualised as pulling together ideas and techniques that have been popular for several decades including JIT production, TQM, continuous improvement, Business Process Re-engineering and teamworking (Kinnie et al., 1998; Radnor & Boaden, 2008). Rich (2001) defines Lean as constituting JIT (delivery focus), TQM (quality focus) and Total Productive Maintenance (cost focus) and argues that these three approaches interact to create the Lean enterprise operations system. Although the techniques that characterise Lean are in themselves not considered new, Lean offers a holistic approach that combines these techniques in a way that has not been done before.

Based on their extensive research in the automotive sector, Womack and Jones (1996) proposed five principles underlying the Lean philosophy which they claim can be equally applied to different manufacturing and service sectors (see Table 2.1). The fifth principle sits at the heart of the TPS and Ohno (1988) identifies seven forms of waste that should be avoided for optimum efficiency (see Table 2.2). Emiliani (1998) subsequently identified an eighth waste – ineffective use of human resources, specifically employee ideas, skills and abilities. Despite recognition of this eighth waste, there is still a strong tendency for academics and practitioners to focus only on Ohno's (1988) original seven wastes.

Table 2.1: Five Lean Principles

1	Specify value by determining what does and does not create value from the perspective of the customer and the individual organisations, departments and teams
2	Identify all the steps necessary to design, order and produce the product (or service) across the whole value stream to highlight non-value adding waste
3	Make those actions that create value flow without interruption, detours, backflows, waiting or scrap
4	Introduce pull between all steps of the process
5	Strive for perfection by continually removing successive layers of waste as and when they are uncovered.

Table 2.2: Seven Wastes

1	Overproduction	Producing 'just-in-case' instead of 'just-in-time' for customer orders
2	Transportation	Moving goods around a site without adding value
3	Motion	Unnecessary movement of people
4	Waiting	Waiting for parts/tools to become available or equipment to be repaired
5	Processing	Processing using non-value adding steps
6	Inventory	Having excess inventory
7	Defects	Production of defects

Since the advent of Lean, a number of tools and techniques have been developed and validated to help organisations identify waste and improve their processes. Some of the most popular are listed in Table 2.3.

Table 2.3: Popular Lean Tools and Techniques, and their Functions

Tool	**Description and Function**
Kanban	A shopfloor control system of physical 'card' signals that indicates the need for additional parts/materials based on actual usage or demand
SMED (Single Minute Exchange of Dies)	Facilitates quick changeovers/set-up times
5S	Represents Sort, Sweep, Straighten, Shine and Sustain. Provides systematic standardisation and visualisation of the workplace so that employees can easily see flow and waste, and can work in an organised, efficient, disciplined, safe and clean environment
Value Stream Mapping	Helps visualisation and understanding of end-to-end flow, value and waste by mapping the entire value stream
Kaizen Blitz or Rapid Improvement Event	Highly focused 3-5 day improvement programme that seeks to boost performance by focusing on key areas or processes while emphasising teamwork and innovation
Poka Yoke	Facilitates error prevention and mistake proofing through product and process design
Total Productive Maintenance	Programme of periodic machine maintenance by workers to minimise the frequency and duration of machine breakdowns.
TQM	Improves process and product quality through statistical process control and empowering workers to stop the production line if defects are identified

Quality is inherently part of the Lean approach to improvement and is emphasized in Ohno's (1988) seventh waste - the production of defects. Lean was highly influenced by the quality movement and owes much to the work of the early quality gurus such as Deming, Juran, Ishikawa and Shingo. Deming (1986) asserted that variation from standards leads to errors in products or services and argued that 94% of problems

belong to the system. He developed a statistical quality improvement concept, the plan-do-check-act Deming circle, and 14 points for managers to address to improve the system. Several of these points specifically relate to quality (eliminate the need for mass inspection by building quality into the product; and continuously improve the system of production and service to improve quality and productivity). Deming's work led to the Deming Prize, which is awarded to companies for major advances in quality improvement. Juran (1988) focuses more on the wider issues of quality, namely planning and organisation, management's responsibility for quality and the need to set improvement goals and targets. He argues that quality control should be an integral part of management control, and emphasises the significant cost savings of having high quality, zero-defect goods and services. Ishikawa (1985), a pioneer of the quality circle movement in Japan, developed seven basic tools for process and quality improvement. The best known tool is the Ishikawa diagram, also known as the cause-and-effect or fishbone diagram. This diagram is used by employees to explore the factors that impact on quality such as equipment and work methods.

Toyota, the originator of the Lean approach, has a long history of working with quality gurus, has set many quality standards and endorses best practices (Womack et al., 1990). Indeed, Toyota was founded as a business through the invention of a mistake proofing device for weaving looms before it entered the automotive market. The quality gurus Deming and Juran were sent to Post War Japan and generated awareness of the need for quality through the Japanese Union of Scientists and Engineering. During the initial visits to Japan, these two quality gurus were invited to teach quality throughout Toyota, which eventually led to Toyota winning the Deming Prize in 1964. The Lean approach to management is inextricably linked with the quality of products and services by establishing processes and procedures that can detect defects, trace problems to their ultimate causes and avoid defective products/services continuing through the system.

Shingo's (1986) work on quality has had a significant impact upon Toyota, where he consulted for many years, and upon the Lean model that has since developed (Womack and Jones, 1996). Lean emphasizes the concept of zero quality control via methods such as mistake proofing or poka-yoke, which uses devises or work methods that stop the process whenever a defect occurs, defines the cause of the

defect, and prevents the recurring source of the defect. Source inspection (employees checking their own work before passing anything onto the next stage in the process), stopping operations as soon as a mistake is made, and ensuring setup quality are all endorsed.

Toyota believe that quality is a part of Lean and the TPS is often modelled as having two pillars, one being JIT and the other *Jidoka* (Rosenthal, 2009). Standard and Davis (1999) translate *Jidoka* to mean quality-at-the-source and Monden (1983) interprets it as automatic control of defects. Both interpretations relate to a process of detecting and correcting production defects and ensuring quality.

According to Rich (2001), among the closely related measures of quality, cost and delivery, quality is by far the most important for optimised performance because the production of poor quality leads to poor cost performance and poor adherence to delivery dates. Rich, Bateman, Esain, Massey and Samuel (2006) argue that without quality processes organisations and supply chains cannot achieve optimised performance. Quality is critical because poor quality can result in the unsuccessful implementation of Lean principles. Schonberger (2008) argues that a Lean system will self-destruct without quality and that quality practices make Lean workable – "without quality improvement, defects, scrap, rework, and process variation wreck notions of tightly linked process flows" (2008, p. 6).

Dahlgaard and Dahlgaard-Park (2006) note that the five Lean principles closely resemble the quality improvement process – "the six steps to six sigma" – developed by Motorola between 1983 and 1989. They conclude that "both lean production and six sigma quality comprise management and manufacturing philosophies and concepts, which have the same origin as the management philosophy called TQM – namely Japan's quality evolution" (p. 271).

It is important to note that although Lean is often implemented to improve quality, the general assumption among many authors is that reasonably good quality is in place prior to Lean implementation (Rich et al., 2006). Dahlgaard et al. (2006) even argue that Lean should only be considered as an alternative when companies have

implemented TQM or are in the process of implementing TQM principles, tools and techniques.

Womack et al. (1990) expected Lean to become the standard global manufacturing approach of the 21st century. A report suggests that as many as 50% of UK-owned and 85% of US-owned firms are already applying Lean techniques in at least part of their organisation (EEF Productivity Survey, 2001). Even low-labour costs competitors in China have started to implement Lean (Huang & Liu, 2005). Lean critics admit that "if there is one non-debateable proposition in the early literature it surely must be the claim that Lean production will be the standard manufacturing approach of the 21st century" (Rinehart, Huxley & Robertson, 1997, p. 101).

Lean can certainly showcase an impressive catalogue of success stories. IMVP researchers reported that the New United Motor Manufacturing, Inc (NUMMI) assembly plant, a joint venture between Toyota and General Motors which rescued a failing US General Motors plant, operated 40% more efficiently than typical General Motors plants and at productivity levels similar to those of Toyota, a performance turnaround attributed to the introduction of Lean at NUMMI (Krafcik, 1989). When referencing the work of the Toyota Supplier Support Centre, Liker (2004) states that every mass-producing supplier changing to a Toyota-style line achieved at least a 100% improvement in labour productivity. Lean has also been able to improve substantially the productivity, efficiency and overall competitiveness of manufacturing companies in a variety of industrial sectors, from automotive to electronics (Fujimoto, 1999; Krafcik, 1988; Liker, 2004; MacDuffie 1995; Shah & Ward, 2003; Wood et al., 2004). Such impressive results have been linked to the continuous quests for quality improvements inherent in Lean management practices (Dahlgaard-Park, 2000).

Lean has recently extended into the service sector where it has been successfully applied to improve healthcare (Kollberg et al., 2007; Massey & Williams, 2005), education (Comm & Mathaisel, 2005a, 2005b; Emiliani, 2004a), local government (Krings et al., 2006), legal services (Hines, Martins & Beale, 2008) and public services in general (Bhatia & Drew, 2006; Radnor et al., 2006; Radnor & Walley, 2008). Some of the benefits of applying Lean to public services reported by Radnor

et al (2006) included improving customer waiting times to first appointment in the health sector from an average 23 to 12 days, and improving processing times by two thirds in a local government department. The term 'Lean service' has even been coined to recognise the translation of the Lean philosophy into the service sector (Ahlstrom, 2004; Bowen & Youngdahl, 1998; Seddon, 2002). Clearly Lean has expanded quite considerably from its origins in the automotive industry and, as Womack et al. (1990) predicted, the fundamental principles of Lean (waste identification and reduction, continuous improvement, customer pull) can be successfully applied to different sectors.

Despite these success stories, there are authors who heavily criticise Lean, arguing that it is dehumanising for the worker and puts excessive physical and psychological demands on them (Garrahan & Stewart, 1992; Williams et al., 1992). There are indeed numerous examples of Lean being linked to negative employee outcomes including job losses, work intensification, increased stress and longer working days (Anderson-Connolly et al., 2002; Arnheiter & Maleyeff, 2005; Berggren, 1993; Conti et al., 2006; Delbridge, 1998; Delbridge & Turnbull, 1992; Garrahan & Stewart, 1992; Jackson & Mullarkey, 2000; Kinnie et al., 1996; Landbergis, Cahill & Schnall, 1999; Millman, 1996; Parker & Slaughter, 1988a; Skorstad, 1994; Turnbull, 1988).

To address these potential weaknesses of Lean, experiments were carried out into what was perceived as a more humanistic approach to manufacturing. Volvo's non-assembly, fixed production Uddevalla plant in Sweden represented a new and democratic socio-technical organisational strategy typified by work adapted to people rather than people to machines. Self-management, high levels of decision decentralisation, team autonomy and a flat organisational structure with minimum management and technological controls were key facets (Berggren, 1992; Sandberg, 1995). Volvo gained international recognition for its humanistic philosophy and creative adaptation of technology to enhance the productivity and satisfaction of its employees. However, the approach proved to be financially inefficient and the plant closed in 1992.

Based on this review of the Lean literature, for the purpose of this study, Lean is defined as a philosophy that aims to improve processes and operations throughout the organisation via tools and techniques that help identify and reduce waste, improve the flow of value-adding activities and high quality goods and services, and encourage an inclusive culture of continuous improvement.

2.3 Motivation for Study

Most current Lean practice and research have been process orientated, focusing predominantly on the tools and techniques summarised in Table 2.3. Comparatively, there has been little research on the human and behavioural dimensions of Lean (Hines et al., 2004). Although literature exists on the experiences of employees in organisations implementing Lean or Lean-type initiatives (Anderson-Connolly et al., 2002; Berggren, 1992; Conti et al., 2006; Delbridge, 1995, 2005; Jackson & Mullarkey, 2000; Lewchuk & Robertson, 1996; Parker, 2003; Seppälä & Klemola, 2004), few researchers have explored the individual-level factors underlying employee motivation for, and engagement in, Lean behaviours (LBs). This is surprising given observations from a number of authors that the success and sustainability of improvement initiatives such as Lean are highly dependent upon employee motivation, commitment and behaviour, and the reported prevalence of employee resistance to Lean and Lean-type programmes (Adler, 1993a; Benders, 1996; Berggren, 1993; Delbridge, 1995, 1998; Emiliani, 1998; Ezzamel et al., 2001; Fiume, 2004; Forrester, 1995; Goyal & Deshmukh, 1992; Grönning, 1995; Lean Enterprise Institute, 2007; MacDuffie, 1995; Radnor et al., 2006; Rehder, 1994; Sawhney & Chason, 2005; Shadur et al., 1995; Sohal & Eggleston, 1994; Womack et al., 1990).

Research conducted within the occupational psychology and operations management fields suggests that various individual-level constructs (organisational commitment, job satisfaction, perceived supervisory support, personality, attitudes) influence employee receptiveness to change and employee reactions to Lean-type initiatives such as TQM and JIT (Antoni, 2004; Cordery, Sevastos, Mueller & Parker, 1993; Coyle-Shapiro & Morrow, 2003; Cunnigham, Woodward, Shannon, Macintosh, Lendrum, Rosenbloom & Brown, 2002; Griffin & Hesketh, 2005; Iverson, 1996;

McLachlin, 1997; Steel & Lloyd, 1988; Vakola, Tsaousis & Nikolaou, 2004). Yet, as this review will demonstrate, few academics have built on this research to understand in any great depth the range of individual-level variables that predict employee motivation for, and engagement in, LBs.

Given the reported prevalence of employee resistance to Lean discussed in Section 1.3 and the importance of employee motivation for successful Lean implementation, there is a need for empirical research into what determines employees to assume a Leaner approach to their work. One of the main objectives of the current study is to address this largely neglected area by considering holistically a variety of individual-level constructs that are likely to influence employee motivation for, and employee engagement in, LBs.

2.4. Defining Lean Behaviours

The behaviours employees in organisations implementing Lean are encouraged to adopt are distinctly different from the employee behaviours endorsed in traditional organisations (Krafcik, 1988). The bedrock of the traditional management mindset is 'command and control', in which lower level employees are controlled by rigid rules made and enforced by senior management (Seddon, 2003). The Lean management approach, in contrast, views all employees as a source of intellectual capital and affords workers of all levels opportunities to engage in decision-making, suggestion-making and problem-solving.

Building on the Lean principles proposed by Womack and Jones (1996), Emiliani (1998) coined the term 'Lean Behaviours' (LBs) which are defined quite simply as behaviours that add or create value. He draws a distinction between LBs (calmness, benevolence, generosity, understanding, respect, trust, cooperation) and 'fat' behaviours – behaviours that add no value (irrationality, revenge, inaction, negativity, deception), and provides a list of the consequences of fat behaviours commonly found in the workplace (rumours, low trust, confusion, conflict, mistakes repeated, employee turnover). According to Emiliani (1998), organisations need employees with the appropriate behavioural make-up to create an efficient and sustainable Lean business, a view shared by other authors (De Geus, 1997; Senge, 1990).

Despite coining the term 'Lean Behaviours', Emiliani's (1998) work says very little about the actual behaviours or the tasks/activities employees in organisations implementing Lean should perform. Rather, he defines LBs more as behavioural dispositions or personality characteristics. Furthermore, his list of Lean and fat behaviours is intuitively rather than empirically based.

Parker (1998) recognised, along with other authors (Campbell, 2000; Dean & Snell, 1991; Frese & Fay, 2001; Jenkins & Delbridge, 2007; Lawler, 1994; Mohrman & Cohen, 1995; Syrett & Lammiman, 1997), that to compete successfully in a global marketplace and to satisfy demanding customers, performance of a predefined set of prescribed tasks is no longer adequate. Instead, organisations need flexible employees who are willing and confident to adopt a broader, more proactive role in the workplace, and who will apply their knowledge and exercise personal initiative. Parker (1998) developed a measure, subsequently called the Role-Breadth Self-Efficacy (RBSE) Scale, which assesses the extent to which employees feel confident adopting a range of proactive, interpersonal, integrative behaviours that fall beyond prescribed technical job requirements. In developing the measure, a cross-section of staff from a glass manufacturing company were interviewed and asked to describe non-technical activities and behaviours they felt were increasingly important for them to engage in to be effective in their job. The interviews yielded 20 behaviours, of which 10 were judged by Parker (1998) to be the most generalisable to other organisations. Although not specifically labelled as Lean, the types of behaviour identified included some of the behaviours employees in organisations implementing Lean would be encouraged to adopt (see Table 2.4).

Unlike Emiliani (1998), Parker (1998) had developed an empirically based measure that incorporated some key Lean activities and behaviours. Parker's measure was by no means exhaustive with regard to LBs. A number of other authors have highlighted some additional important LBs not included in Parker's scale. Based on a review of some illustrative literatures, including Appelbaum and Batt (1994), Berggren (1993), Forza, (1996), Jackson, Wall, Martin and Davids (1993), Krafcik, (1988), MacDuffie, (1995), Niepce and Molleman (1998), Parker (1998), Rees et al. (1996) and Womack et al. (1990), the most frequently mentioned LBs relate to suggestion-making, problem-solving, participative decision-making, teamworking, autonomous working,

job rotations, multi-skilling, volunteering for extra-job activities and maintaining a neat, tidy and safe workplace. Making suggestions for improvement consistently emerges in the literature as one of the most important and arguably prototypical LBs because it relates to employees exploring ways in which waste could be eliminated, processes streamlined and quality improved.

Although it could be argued that this list of LBs is not exhaustive and excludes LBs such as the use of visual management systems or the use of fishbone diagrams, the researcher considered it necessary to draw boundaries around what constituted LBs by selecting the behaviours most frequently mentioned in the literature. It was particularly important to keep the list of LBs succinct because, as will become apparent in Section 3.5.2., employees would be asked to complete a LBs measure along with a number of other measures, resulting in a fairly lengthy questionnaire. Keeping the questionnaire down to a reasonable length was important in order to encourage participation, so concise measures were preferred. In the following section each of the LBs will be discussed in detail, including how they link to the five Lean principles summarised in Table 2.1. Although the behaviours are presented under separate headings, it will become apparent that there are some clear overlaps and commonalities between them.

Table 2.4: Items in Parker's (1998) RBSE Scale

Designing new procedures for your work area
Visiting people from other departments to suggest doing things differently
Analysing a long-term problem to find a solution
Helping to set targets/goals in your work area
Contributing to discussions about the company's strategy
Making suggestions to management about ways to improve the working of your section
Writing a proposal to spend money in your work area
Contacting people outside the company (e.g., suppliers, customers) to discuss problems
Presenting information to a group of colleagues
Representing your work area in meetings with senior management

Suggestion-making

Continuous improvement, or *Kaizen*, is a key feature of Lean. To be truly Lean, a company must constantly strive for perfection in their processes in order to eliminate actual and potential layers of waste in the value stream. To achieve this, employees at all levels are encouraged to constantly seek ways in which waste can be eliminated within their organisation and across the wider supply chain, and processes and methods improved. One mechanism to facilitate this is through suggestion boxes, which allow employees to provide suggestions for improvement, and can create a climate in which employees are motivated to promote and support innovation and change by facilitating a sense of commitment (Bassett-Jones & Lloyd, 2005). Employee suggestion schemes can lead to significant production improvements (Rothenberg, 2003; Womack & Jones, 1996) and annual savings as high as 750,000 US dollars (Frese, Teng & Wijnen, 1999). The ongoing nature of *Kaizen* means that the elimination of waste and the achievement of improvement goals at one level are not viewed as ends in themselves but as foundations for initiating further improvement initiatives and generating new, more challenging goals (Monden, 1983; Womack et al., 1990). Suggestion-making is therefore an employee behaviour that is constantly encouraged, irrespective of the maturity of Lean within the business.

Problem-solving

Employee problem solving, an essential behaviour at Toyota (Spear & Bowen, 1999), is given top priority (Berggren, 1993) and can be facilitated by applying tools such as the 5 'whys' (asking why five or more times until the root cause of a problem is uncovered) and fishbone/cause-and-effect diagrams (Emiliani, 2000). The principle of making value-adding actions flow without interruption, detours, backflows, or waiting is partly concerned with problem-solving. Employees need to engage with their work environment to seek ways in which process problems can be solved to enhance flow. Womack et al. (1990) consider problem-solving to be an important aspect of a continuous improvement environment and believe that Lean organisations should be primarily populated with "highly skilled problem-solvers whose task will be to think continually of ways to make the system run more smoothly and

productively" (p. 102). Not surprisingly, problem-solving is heavily emphasised in Toyota's recruitment procedures (Berggren, 1993).

Participative Decision-making

Lean seeks to reduce system variability through standardisation and documentation of value-adding processes which employees are expected to follow (Fujimoto, 1999). Employees are encouraged to develop procedures because it is assumed (a) that the people actually running the process have access to unique knowledge and insights concerning how the process operates, and (b) that participation in developing the procedures will give employees a sense of ownership which will ultimately increase their willingness to run the process as documented (De Treville, Antonakis & Edelson, 2005; Fujimoto, 1999). Lean therefore promotes company-wide participative decision-making and encourages all workers to contribute to discussions about the company's strategy and what processes and procedures should be in place to help realise that strategy and reduce waste. Adler (1993b) provides compelling evidence that employee participative decision-making can result in improved processes, performance and morale.

Teamworking

According to Womack and colleagues "...it is the dynamic work team that emerges at the heart of the Lean factory" (Womack et al., 1990, p. 99). Teamworking has been referred to as the "glue" that holds the Lean production system together (Krafcik, 1988) and "can be [a] major determinant of success" (Wickins, 1987, p. 38). MacDuffie and Pil (1997) claim that teams that encourage worker participation in decision-making and problem-solving are central to Lean and, when complemented by supportive Human Resource Management practices, can contribute to improved performance. Radnor et al. (2006) equally recognise the importance of teamworking, providing evidence that teamwork enables organisations to generate capacity for improvement, breaks down hierarchical boundaries and helps develop a sense of cross-departmental collaborative working. Presumably, it is for these reasons that assessment of a person's group orientation and social skills and their ability to fit

within a co-operative culture is a central feature of Toyota's recruitment procedures (Winfield, 1994).

Two of Womack and Jones' (1996) Lean principles – make those actions that create value flow without interruption, and introduce pull between all steps of the process – are predominantly concerned with effective teamworking. The removal of buffers between processes creates interdependence in which employees need to collaborate with, and are dependent on, each other. Cross-functional teamworking is particularly important because Lean drives a process-based as opposed to functional-based system. *Kaizen*, implied in the fifth Lean principle, represents an ongoing programme of improving processes, quality and costs through the cooperative efforts of employees (Fullerton, McWatters & Fawson, 2003). Without employee co-operation and teamworking, improvements are unlikely to be made or sustained. Adler (1993b) observed that teamworking can change employee's jobs in subtle ways that help further continuous improvement, and that team participation helps create responsibility and commitment among workers.

Employee Autonomy and Empowerment

Suggestion-making, problem-solving and participative decision-making have an important common denominator – they each afford employees greater autonomy and empowerment. Hackman and Oldham (1975) define job autonomy as "the degree to which the job provides substantial freedom, independence and discretion" (1975, p. 162). According to Womack et al. (1990), Lean seeks to transfer "the maximum number of tasks and responsibilities to those workers actually adding value" (p. 99), and "to push responsibility far down the organisational ladder. Responsibility means freedom to control one's work..." (p. 14). Lean advocates that *all* employees should acknowledge their own responsibility for delivering high quality goods and services and for fulfilling customer needs. Employee initiative and willingness to adopt a more empowering and autonomous role are important aspects of Lean, and are essential for flow. Lean also supports worker participation in target/goal-setting activities which can lead to significant improvements in individual and group performance on a wide range of tasks (Locke, Shaw, Saari & Latham, 1981; Mento, Steel & Karren, 1987).

Job Rotation and Multi-skilling

Lean criticises the traditional division of labour by countless narrowly defined job classifications, arguing that they contribute to inefficiency and constrain the organisation's ability to redeploy labour as a function of demand fluctuations. To facilitate flow and to foster employee appreciation for the process and customer value, workers in Lean organisations are encouraged to rotate jobs and tasks with their fellow colleagues. Job rotations, defined as "lateral transfers of employees between jobs in an organisation" (Campion, Cheraskin, Stevens, 1994, p. 1518), foster cross-functional teamworking and serve to enhance employee's jobs by offering them greater variety and enabling them to apply a wider range of skills. Rotations provide a powerful impetus for informal on-the-job learning and training, enabling workers to develop their knowledge and skills portfolio, thus providing the organisation with a multi-skilled workforce capable of taking on broader job roles and undertaking jobs as and when required. By offering employees the opportunity to acquire the necessary knowledge to solve problems, rotations also support problem-solving. Exposure to a greater number of job tasks and an understanding of how these tasks relate to one another has been shown to increase worker tacit knowledge (Nonaka, 1994).

Volunteering for Extra-job Activities

Organisational Citizenship Behaviours reflect "individual contributions in the workplace that go beyond role requirements and contractually rewarded job achievements" (Organ & Ryan, 1995, p. 775) and contribute "to the maintenance and enhancement of the social and psychological context that supports task performance" (Organ, 1997, p. 91). These extra-role discretionary behaviours involve volunteering for activities that are not main task functions but are important because they shape the organisational and social context that supports task activities and organisational performance. They could include behaviours such as designing new procedures for the work area, taking part in activities aimed at improving the working of the section, making suggestions for improvement, representing one's work area in meetings with senior management, helping to set targets/goals in one's work area, training colleagues and volunteering to present information to colleagues. Although Womack

et al. (1990) do not use the term Organisational Citizenship Behaviour, the behaviours they argue are necessary for continuous improvement arguably fall under this umbrella term. Employee willingness to volunteer to take on these activities is important for organisations implementing Lean if they want to improve continuously and to operate effectively.

Maintaining a Neat, Tidy and Safe Workplace.

In order to make those actions that create value flow without interruption, detours, backflows or waiting, it is necessary for employees to have a neat, tidy and safe work environment. 5S (Sort, Sweep, Straighten, Shine, Sustain) is a structured approach for creating such discipline, and provides systematic standardisation and visualisation of the workplace so that employees can easily see waste and flow (Massey & Williams, 2005). Once 5S has been initially implemented, employees are encouraged to maintain a neat, tidy and safe workplace that will help them to operate in an efficient, organised and safe manner.

2.5. Potential Individual-level Antecedents of Employee Motivation for Lean

This section reviews some variables which, based on a critical review of the relevant literature, are potential antecedents of employee intentions to adopt, and future employee engagement in, LBs. Studies on employee receptiveness to management initiatives that incorporate elements of Lean (JIT, TQM, continuous improvement) will be reviewed given their relevance to the study. Because the introduction of Lean within an organisation usually represents a form of change programme and because attitudes to change and engagement in proactive behaviours are positively related (Parker, Williams & Turner, 2006), studies exploring the individual-level factors underlying employee reactions to organisational change are also considered. Chapter 3 will discuss in detail how LBs were measured but suffice to say that the behaviours discussed in Section 2.4 are considered as LBs.

2.5.1. Core Theoretical Model

2.5.1.1. Theory of Planned Behaviour (TPB)

To understand likely employee reactions to Lean and employee willingness to adopt LBs, it is useful to explore how psychologists have attempted to understand, explain and predict human behaviour. Ajzen's (1985, 1991, 2005) Theory of Planned Behaviour (TPB) is a well-established socio-cognitive expectancy-value model that has been used extensively to understand the behavioural choices individuals make in a wide variety of situations by considering the informational and motivational influences on behaviour.

The TPB is an extension of the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). According to the TRA, the immediate determinant of behaviour is intentions which reflect a general willingness, motivation and conscious plan to perform the behaviour, and indicate how much effort people are willing to exert to enact the behaviour. When measured at the same level of specificity relative to action, target, context and time frame, and when the time interval is short enough to ensure that intentions have not changed, intentions and behaviour are highly correlated (see Fishbein & Ajzen's, 1975, principle of compatibility). The TRA asserts that intentions are influenced by two cognitive constructs: *subjective Norms* - salient beliefs about how people significant to the individual would view their execution of the behaviour weighted by their motivation to comply with these significant others; and *attitudes*, which can be conceptualised generally (an individual's general level of positive or negative feeling concerning their engagement in the behaviour) and specifically (an individual's salient beliefs regarding the outcome of engagement in the behaviour weighted by the evaluation of those outcomes). The general and specific conceptualisations of attitude are often refereed in the TPB literature as 'direct' and 'indirect' attitudes respectively.

The TRA only applies to behaviours under the individual's complete volitional control (Ajzen & Madden, 1986) and hence is likely to be a poor predictor of behaviours depending on external, non-motivational factors such as skills, resources (time, money), co-operation of others or opportunities. Recognising this limitation,

Ajzen (1985, 1991, 2005) proposed the TPB (Figure 1), which extends the TRA by incorporating the construct of *Perceived Behavioural Control* (PBC) – salient control beliefs about how easy or difficult it is to perform the behaviour weighted by their frequency of occurrence. PBC influences behaviour both indirectly (via intentions) and directly and is particularly important when volitional control over a behaviour is compromised. Individuals are more likely to perform positively perceived behaviours that they have control over and less likely to perform positively perceived behaviours over which they have little or no control. When intentions are held constant and PBC increases, effort exerted to achieve behavioural performance increases and behaviour is more likely to occur. When PBC equates to actual control, it accurately predicts behaviour (Ajzen & Madden, 1986). However, sufficient direct or indirect experience of the behaviour is needed for realistic PBC. Unrealistic PBC add little to the prediction of behaviour. PBC explains significant amounts of variance in intentions and behaviour independent of TRA variables, thus supporting the superiority of the TPB to the TRA (Ajzen, 1991; Armitage & Conner, 2001a).

Both the TPB and TRA are regarded as deliberative processing models because they assume that the careful consideration of all available information is what drives individuals to make behavioural decisions (Conner & Armitage, 1998; Conner & Sparks, 1996). As shown in Figure 2.1, beliefs are considered to be the primary source of behaviour and changes in beliefs are theorised to lead to changes in behaviour through one or more of the three TPB predictors of attitude, subjective norm and PBC[2]. The TPB represents a complete theory of the proximal determinants of behaviour. According to Ajzen (1991), the influences of non-TPB variables (e.g., personality, demographics) on behaviour are argued to be indirect and mediated by the social-cognitive constructs contained within the TPB. The relative importance of attitudes, subjective norms and PBC in predicting intentions varies across behaviours and situations as does the relative importance of intentions and PBC in predicting behaviour (Ajzen, 1991; Ajzen & Fishbein, 2004). To summarise, the TPB states that individuals are more likely to have strong intentions to perform a behaviour and actually perform that behaviour if they believe that doing so will lead to valued positive outcomes; that people important to them think that they should perform the

[2] Future references to 'TPB predictors' refer to attitude, subjective norm and PBC.

behaviour and that they are motivated to comply with the wishes of these significant others; and that they can easily perform the behaviour.

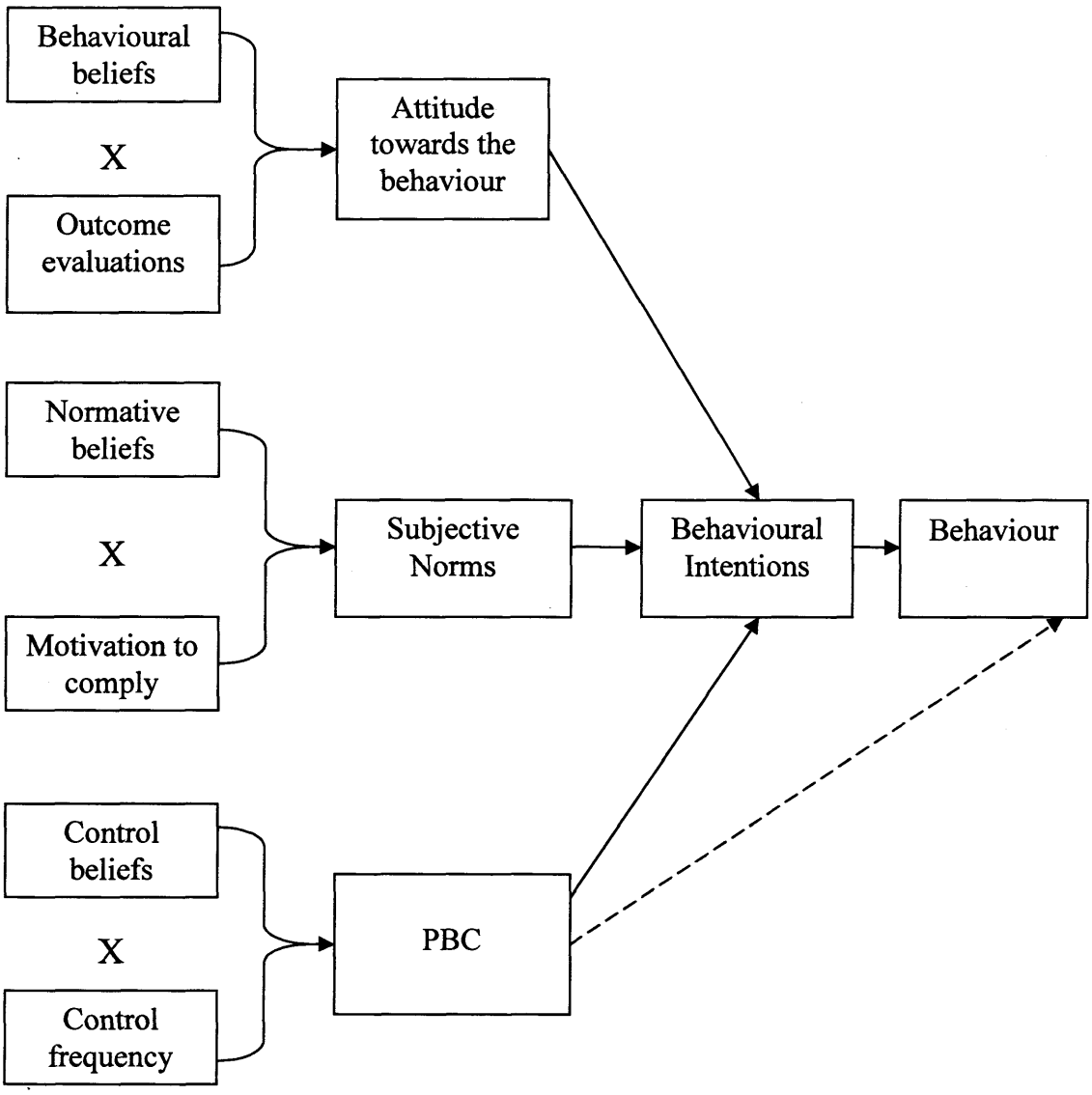

Figure 2.1: Theory of Planned Behaviour

Several reviews and meta-analyses have provided compelling empirical support for the TPB across a wide range of behaviours from engaging in leisure activities to shoplifting (Ajzen, 1991; Armitage & Conner, 2001a; Blue, 1995; Conner & Armitage, 1998; Conner & Sparks, 1996, 2005; Godin & Kok, 1996; Hausenblas, Carron & Mack, 1997; Manstead & Parker, 1995; Ouellette & Wood, 1998; Sparks, 1994). Armitage and Conner's (2001a) meta-analysis, which overcame some of the methodological weaknesses of earlier meta-analyses (such as limited sampling)

showed that attitude, subjective norm and PBC accounted for a frequency-weighted average of 39% of the variance in intentions across 154 applications; and that intentions and PBC accounted for 27% of the variance in behaviour across 63 applications. PBC influenced behaviour directly (adding 2% to the prediction of behaviour) and indirectly (adding 6% to the prediction of intentions). Similar percentages were reported in Conner and Sparks' (2005) meta-analysis of meta-analyses on the TPB. They reported that, across 200+ studies with a combined sample size of over 50,000, attitude, subjective norm and PBC explained 33.7% of the variance in intentions, and intentions and PBC explained 25.6% of the variance in behaviour. Intentions had a large effect on behaviour (r = 0.48), similar to the 0.47 reported by Armitage and Conner (2001a). The TPB can also explain as much as 20% of the variance in observed as opposed to self-reported behaviour (Armitage & Conner, 2001a). Several reviews have demonstrated the effectiveness of behaviour change interventions based on TPB theory (Hardeman, Johnston, Johnston, Bonetti, Wareham & Kinmonth, 2002; Webb & Sheeran, 2006). In most of the interventions, information relevant to one or more of the TPB predictors was provided and its effect on behaviour was attributable to the theoretical antecedents. There is clearly overwhelming empirical support for the predictive power of the socio-cognitive constructs contained within the TPB to explain behaviour.

As discussed in Section 1.3, Lean has been linked to a number of negative outcomes for employees and numerous authors have reported a tendency for employees to react negatively to Lean. Despite these observations, there has to date been little systematic research on the beliefs employees in organisations implementing Lean hold regarding the positive and negative outcomes of their adoption of LBs. The present research seeks to address this research gap ***(Research gap 1).*** Given the purported link between intentions and behaviour as defined by the TPB, the researcher is also interested in whether the strength of these beliefs varies according to whether an employee reports intentions to adopt LBs. This is an important area to investigate and could suggest some potential interventions for securing employee buy-in for Lean. As shown in Figure 2.1, beliefs are considered the primary source of behaviour. Identification of beliefs can help distinguish between groups of individuals and provide useful targets for interventions aimed at changing behaviour

(Ajzen, 1991; Fishbein & Ajzen, 1975; Manstead & Parker, 1995). Due to the exploratory nature of this research objective, hypotheses are not generated.

The importance of beliefs in determining employee reactions to improvement initiatives has been recognised. Miller and Pritchard (1992) investigated the factors associated with employees' inclination to participate in an employee involvement programme, which is a term broadly used to describe quality circles and self-management work groups. They found that the more workers believed that participating in an employee involvement programme would have positive impacts on the organisation and themselves, the more likely they were to volunteer for such programmes. Emiliani (2003, 2004b) argues that the beliefs of leaders skilled in the Lean management system underlie their behaviour and that value stream maps, a popular Lean tool, can be used to identify and reshape beliefs and behaviours. Radnor et al. (2006) also highlight the significance of addressing employee beliefs and expectations for effective Lean implementation.

Despite the TPB's widespread application, the efficacy of the model to explain employee intentions to adopt, and future employee engagement in, LBs, has not been explored. Presumably this gap exists because Lean and the TPB originate from different disciplines and are typically explored in different literatures. The study investigates such an application ***(Research gap 2)***. There are potentially huge practical implications of this research for organisations implementing Lean because the TPB is a powerful model for helping to design interventions that produce behaviour change (Ajzen, 1991; Bamberg, Ajzen & Schmidt, 2003; Fishbein, 1997; Hardeman et al., 2002; Webb & Sheeran, 2006).

Past research has demonstrated that the TPB can be successfully applied to understand various employee behaviours including support for organisational change (Jimmieson, Peach & White, 2008; Peach, Jimmieson & White, 2005), adoption of information systems (Harrison, Mykytyn & Riemenschneider, 1997; Taylor & Todd, 1995), knowledge-sharing (Ryu, Ho & Han, 2003; So & Bolloju, 2005), management benchmarking (Hill, Mann & Wearing, 1996) and job searching (Wanberg, Glomb, Song & Sorenson, 2005). A study particularly relevant to the current investigation explored the application of the TPB to employee intentions to

support an employee involvement programme (Dawkins & Frass, 2005). The authors reported support for the TPB - intentions were significantly and positively correlated with attitude ($r = 0.36, p < 0.01$), subjective norms ($r = 0.33, p < 0.01$) and PBC ($r = 0.32, p < 0.01$). They concluded that the TPB represents an effective tool for understanding workers' responses to employee improvement initiatives and that "it is particularly useful for predicting intentions and behaviour in organisations because, among other things, it focuses on workers' beliefs about the opinions of relevant others and the degree to which workers believe they can control their behavioural choices" (p. 512). Although this study partly bridges research gap 2, it by no means closes it. The study did not consider employee willingness to engage in the full range of LBs discussed in Section 2.4; it failed to measure actual employee behaviour and so the TPB model was not fully tested; and the findings are based on a very small sample of employees ($n = 87$) in only one manufacturing plant, thus limiting generalisability. A clear research gap evidently still exists.

Past research has investigated the role of perceived supervisory expectations and support on employee adoption of, and receptiveness to, Lean-type behaviours. Scott and Bruce (1994) reported a positive relationship between supervisory expectations and subordinate innovative behaviour. Studies have also reported positive links between supervisory support and employee openness to TQM practice and quality circles (Steel & Lloyd, 1988), employee engagement in proactive, creative behaviours (Amabile, Conti, Coon, Lazenby & Herron, 1996; Crant, 2000; Parker et al., 2006), and employee knowledge-sharing behaviour (Cabrera, Collins & Salgado, 2006). The organisational change literature suggests that employees who perceive a norm of acceptance for organisational change are usually more accepting of change themselves (Antoni, 2004; Brown, Massey, Montoya-Weiss, & Burkman, 2002). The opinions of colleagues, family and friends are equally critical in shaping the views of workers. Interpersonal support is essential during times of change (Gerpott, 1990) and colleagues, family and friends can influence how employee involvement programmes are perceived (Ackers, Marchington, Wilkinson & Goodman, 1992; Dawkins & Frass, 2005). Although this research relates to research gap 2, the link between subjective norms and employee motivation for, and engagement in, the full range of LBs has not been studied.

Based on the theoretical foundations of the TPB and the results of previous applications of the model, the following hypotheses are proposed:

H1: The more positive employees' attitudes are towards their adopting of LBs, the stronger will be their intentions to engage in LBs.

H2: The more positive are employees' subjective norms to adopt LBs, the stronger will be their intentions to engage in LBs.

H3: The higher are employees' PBC with respect to adopting LBs, the stronger will be their intentions to engage in LBs.

H4: Intentions and future engagement in LBs will be positively related.

According to Ajzen, "the addition of PBC should become increasingly useful as volitional control over the behaviour declines" (1991, p. 185). An employee's ability to perform many of the LBs is dependent upon external factors such as co-operation of colleagues and organisational policies and procedures. Job rotation and team-working and, to an extent, maintaining a neat, tidy and safe work area, are highly reliant upon adequate co-operation from colleagues. Appropriate policies and procedures are needed to enable employees to assume an autonomous approach to their work and to engage in problem-solving, participative decision-making and suggestion-making. PBC is expected to predict employee engagement in LBs independent of intentions.

H5: PBC will have a direct relationship with future engagement in LBs independent of intentions.

2.5.1.2. Rationale for Selecting TPB for Study

The researcher made an informed decision to use the TPB framework to explore the antecedents of employee motivation for LBs as opposed to more traditional

management-based employee motivation theories. This decision was partly based on some key criticisms and limitations of these theories[3].

Maslow's (1943) Hierarchy of Needs theory states that human needs are hierarchically arranged. Individuals are initially motivated to fulfil basic physiological needs (food, shelter) before addressing hierarchically the needs of security, belongingness and esteem. The ultimate need is self-actualisation in which one's potential, particularly in the intellectual and creative domains, is fully realised. This need is only addressed once all preceding needs have been fulfilled. Maslow's theory has been heavily criticised. According to Ewen (1992, p. 420): "Maslow's eclecticism [...] seems insufficiently thought out and includes too many confusions and contradictions. His study of self-actualizers has been criticized on methodological grounds, and his theoretical constructs have been characterized as overly vague, equivocal and untestable". Empirical research on the hierarchical emergence of needs has also suggested an ambiguity surrounding the specific order in which needs emerge (Heylighen, 1992; Pinder, 1984; Steers & Porter, 1987; Wahba & Bridwell, 1976).

To address some of the criticisms of Maslow's (1943) theory, Alderfer (1972) developed an alternative hierarchical theory of motivation known as Existence Relatedness Growth (ERG) theory. This collapses Maslow's needs into three categories. Existence needs constitute physiological and security needs. Relatedness encompasses the need to belong and develop interpersonal relationships. Self-esteem and self-actualisation needs are conceptualised as growth needs. Unlike Maslow's theory, ERG theory assumes that more than one level of need can motivate behaviour simultaneously. Although ERG theory appears to represent a more valid model for understanding employee motivation than Maslow's (1943) theory (Pinder, 1984), it has received mixed reviews when empirically tested (Schneider & Alderfer, 1973) and there is some ambiguity surrounding measurement of the constructs (Alderfer, 1972).

[3] Although a number of other socio-cognitive models have been developed with the view to explaining behaviour such as Protection Motivation Theory (Rogers, 1983), the Health Belief Model (Rosenstock, 1974), and the Transtheoretical Model of Change (Prochaska & Velicer, 1997), these models have rarely, if at all, been applied to employee behaviour. The researcher will therefore only focus on the traditional employee motivation theories because they are of greater relevance to the current study.

Hertzberg's (1959) Two Factor theory was developed based on a series of 200 interviews involving critical incident analysis with accountants and engineers. It was discovered that factors associated with satisfaction and high motivation (achievement, recognition, status, promotional opportunities, responsibility) were distinctively different from factors associated with dissatisfaction and low motivation (working conditions, salary). These factors became known as motivators and hygiene factors, respectively. It was argued that the presence of motivators increases job satisfaction and motivation but their absence does not result in dissatisfaction. If hygiene factors are negative or absent, dissatisfaction occurs; the presence of positive hygiene factors prevents dissatisfaction but does not lead to satisfaction or motivation. Several important limitations of this model have been noted. Replication studies using other methods, principally surveys, failed to find support for the model (Bassett-Jones & Lloyd, 2005; House & Wigdor, 1967; Pinder, 1984). Hulin and Smith (1965) even argued that Herzberg's results were "method bound". Of particular concern, it has been argued that factors such as personality (Evans & McKee, 1970) and social desirability bias (Wall, 1972) could explain Herzberg's findings, which fundamentally compromises the theoretical underpinnings of the model.

Equity theory assumes that behaviour is a function of perceptions and beliefs concerning equity in relationships with employers (Adams, 1963, 1965). Relationships are generally perceived as equitable when outcomes (pay, promotion) are proportionate to perceived inputs (job performance). Individuals are thought to experience distress if they perceive inequality in their relationships. The theory also contains an element of social comparison in that people are thought to compare their perceived input-output ratio with that of others. Equity theory has limited predictability regarding how people react to situations in which they are over-rewarded (Ambrose & Kulik, 1999; Folger, 1986; Leventhal, 1980; Mowday, 1991).

Vroom's (1964) Expectancy theory states that employee motivation is a function of expectancy (perceived probability that effort will lead to good performance), instrumentality (perceived probability that good performance will lead to positive outcomes) and valence (value of expected outcomes to the individual). Similar to equity theory, the assumption is that actions are based on perceptions and beliefs. Of all the motivation theories, it is arguably the closest conceptually to the TPB because

it assumes that individuals make rational decisions based on their expectations and values. However, three extensive reviews suggested that there was limited support for the theory (Heneman & Schwab, 1972; House & Wahba, 1972), and in a study exploring the ability of the theory to explain work motivation, effort expenditure and job performance, it was found to account at best for only very limited variance in behaviour (Reinharth & Wahba, 1975). Several methodological issues have also been raised (Wahba & House, 1974).

Reinforcement theory assumes that behaviour is learned (Skinner, 1953). It constitutes three elements – stimulus, response and consequence. A stimulus represents any variable or condition that initiates a response. A consequence is what follows a response that alters the chances of the response reoccurring following a stimulus. Consequences manifest in three forms – positive reinforcements or rewards (which increase the likelihood of a response), punishments (which decrease the likelihood of a response) and negative reinforcements (removal of a reward or punishment to increase the likelihood of a response). Reinforcement theory has been criticised for failing to consider the cognitive determinants of behaviour and treating humans "as somewhat mindless robots in pursuit of rewards" (D'Aunno, Fottler & O'Connor, 1995, p. 87).

Locke's (1968) Goal-setting theory assumes that individuals are motivated by goals, defined as objectives that individuals are consciously attempting to achieve (Locke & Latham, 1984). Given adequate levels of goal commitment, ability, awareness, motivation and intentions, job performance should increase with greater goal difficulty and specificity. Although goal-setting theory is regarded as one of the most valid and practical theories of employee motivation (Lee & Earley, 1992; Miner, 1984; Pinder, 1998), it sheds limited light on how people become committed to goals and on the rationale for goal-selection. It also has limited focus on the subconscious (Locke & Latham, 2002).

The popular employee motivation theories clearly have some major limitations and weaknesses. In addition to considering these criticisms, the wider objectives of the present research and the types of behaviour under investigation were also borne in

mind in selecting the most appropriate model to explore employee motivation for Lean.

The TPB and TRA explicitly incorporate a behavioural intentions construct that can be easily measured and operationalised. Intentions are often highly correlated with actual behaviour (Ajzen & Fishbein, 1980; Armitage & Conner, 2001a; Conner & Sparks, 2005; Sutton, 1998), which essentially means that behaviour can be predicted before it occurs. If employee intentions to adopt LBs and their future engagement in LBs prove to be sufficiently correlated, this would have important practical implications for organisations implementing Lean by offering a timeframe for intervention. TPB-based interventions can produce large changes in intentions and behaviours and the model "provides a worthwhile basis for developing interventions" (Webb & Sheeran, 2006, p. 261). In addition to building on academic theory, it is intended that some practical recommendations emerge from the current research to assist organisations with their Lean implementations. Tranfield and Starkey (1998) argue that management research should adopt a dual approach to knowledge production that addresses both theory and practice.

By including the subjective norm construct, the TRA and TPB explicitly acknowledge normative, social influences on behaviour. This was considered important because many of the LBs (teamworking, participative decision-making, job rotation, volunteering for extra-role activities) are social behaviours.

The TRA only applies to behaviours under the individual's complete volitional control and, as noted in Section 2.5.1.1, an employee's ability to perform many of the LBs depends upon external, non-motivational factors such as co-operation from colleagues and organisational policies and procedures. By incorporating the PBC construct, the TPB takes account of such external influences and is clearly more appropriate than the TRA for the current study.

Ajzen and Fishbein (1980) draw a distinction between single actions and behavioural categories. A single action is a specific behaviour performed by an individual; for example, in the case of environmentally friendly behaviour it might be recycling. Behavioural categories, on the other hand, involve sets of actions, for example,

inferring the degree to which someone is environmentally friendly by looking at how much they recycle, use public transport rather than the car, and use low-energy light bulbs. As illustrated in Section 2.4, there is no specific action which could be classed as 'adopting LBs', but rather a set of behaviours. The TPB can be successfully applied to single actions and behavioural categories (Ajzen & Fishbein, 1980) so theoretically it should be possible to apply the TPB to employee adoption of LBs.

Considering the limitations of traditional management-based employee motivation theories, the widespread empirical support for the TPB and the relevance of the TPB to the current study, the TPB was considered the most appropriate core model to explore employee motivation for Lean. The TPB is not without limitations. Armitage and Conner's (2001a) meta-analysis, although supportive of the TPB, suggests that 61% of the variance in intentions and 73% of the variance in behaviour remains unexplained by TPB variables. A number of non-TPB variables, job-related and person-related, will be considered in an attempt to explain greater percentages of variance in employee intentions to adopt, and employee engagement in, LBs.

2.5.2. Non-TPB Individual-level Variables

The TPB is presented as a complete theory of the proximal determinants of behaviour. The influence of other variables on intentions and behaviour is argued to be indirect and mediated by the social-cognitive constructs contained within the TPB (Ajzen, 1991). The study will investigate, within the context of LBs, the interactions between TPB and non-TPB variables, job-related (job satisfaction, organisational commitment, Lean self-efficacy, past behaviour, union membership, organisational tenure, employee level) and person-related (personality, gender, age), and explore whether the social-cognitive constructs contained within the TPB explain the influence of these non-TPB variables on intentions and behaviour. As will become apparent, there is a distinct lack of research on employee adoption of LBs and the inclusion of these variables in the study will enable a number of research gaps to be addressed. The decision to include these variables is based on empirical research and theoretical arguments from the operations management and occupational psychology literatures suggesting that they may influence employee reactions to improvement initiatives and organisational change, and on the applied

social psychology literature indicating that some of these constructs influence intentions and behaviour. Considering these factors in addition to the TPB variables will contribute to academic debates about whether the TPB is a complete theory of behaviour within the context of employee engagement in LBs or whether "the predictive power of the TPB is far from perfect" (Conner & Godin, 2007, p. 876). The following sections will discuss the different constructs, their relevance to the study, and the specific hypotheses and their rationales.

2.5.2.1. Job-related Variables

2.5.2.1.1. Job Satisfaction

Job satisfaction, defined as a positive emotional state resulting from the pleasure employees experience from their job (Locke, 1976; Spector, 1997), reflects appraisal of both intrinsic and extrinsic job characteristics. Intrinsic characteristics are associated with the task itself (e.g., challenging work, task autonomy, skill variety) and extrinsic characteristics concern the work context (e.g., the physical working conditions, competitive salary). Job satisfaction is relevant to the current study because it has strong links with a number of employee outcomes, including attitudes towards organisational change (Cordery et al., 1993; Gardner, Dunham, Cummings, & Pierce, 1987; Iverson, 1996), job performance (Organ & Ryan, 1995; Schleicher, Watt & Greguras, 2004), goal commitment (Roberson, 1990) and employee turnover (Shaw, 1999).

Much of the research looking at job satisfaction and Lean has investigated the impact of Lean practices and associated work regimes on employee job satisfaction (Jackson & Martin, 1996; Jackson & Mullarkey 2000; Mullarkey, Jackson & Parker, 1995; Seppälä & Klemola, 2004). This is perhaps not surprising given popular arguments that Lean work systems are dehumanising and lead to a deterioration in working conditions (Delbridge, Turnbull & Wilkinson, 1992; Garrahan & Stewart, 1992; Williams et al., 1992). One study has, however, explored whether job satisfaction is linked to employee approval of Lean. A survey of 200 employees in an automotive factory showed that employees scoring high on job satisfaction were more likely to approve of Lean (Shadur et al., 1995). Although this study offers a

glimpse into the likely relation between job satisfaction and employee receptiveness to Lean, it represents the findings from only 200 people in one organisation and one industry. It also does not consider the relationship between job satisfaction, attitudes and employee intentions to adopt LBs within the context of the TPB. The current research addresses these limitations ***(Research gap 3).***

Based on Shadur et al.'s (1995) findings and research suggesting that employees scoring high on job satisfaction are more inclined to volunteer for employee improvement programmes and to have positive attitudes to change (Cordery et al., 1993; Iverson, 1996, Miller & Pritchard, 1992), job satisfaction is expected to positively relate to attitudes and intentions. However, based on TPB theory, attitude is expected to mediate the positive job satisfaction-intentions relation - people who are more satisfied with their job will have more positive attitudes towards their adoption of LBs and subsequently stronger intentions to engage in LBs.

H6: Attitudes to adopting LBs will mediate the positive relationship between job satisfaction and intentions to adopt LBs.

2.5.2.1.2. Organisational Commitment

The topic of organisational commitment has been the subject of much theoretical and empirical effort in the organisational behaviour and Human Resource Management fields. Organisational commitment reflects "the relative strength of an individual's identification with and involvement in a particular organisation" (Porter, Steers, Mowday & Boulian, 1974, p. 604). A multidimensional construct, it can be conceptualised into three core elements: (a) a strong belief in and acceptance of the organisation's goals and values (affective commitment); (b) a willingness to exert considerable effort on behalf of the organisation (normative commitment); and (c) a strong desire to maintain membership in the organisation (continuance commitment) (Allen & Meyer, 1990; Mowday, Porter & Steers, 1979). Organisational commitment has been linked to various employee outcomes, including performance, absenteeism and employee turnover (Axtell, Holman, Unsworth, Wall, Waterson & Harrington, 2000; Bentein, Vandenberg, Vandenberghe & Stinglhamber, 2005; Riketta, 2002; Somers, 1995). Of particular relevance to the current study, commitment is positively

linked to employees adopting a flexible approach to their work, engaging in proactive work behaviours and accepting a TQM programme (Coyle-Shapiro & Morrow, 2003; Parker et al., 2006).

The little Lean research that has included a measure of organisational commitment has been primarily concerned with the impact of Lean practices on commitment (see Godard, 2001; Parker, 2003) and not with how organisational commitment influences employee motivation to engage in LBs. The only exception to this is, once again, Shadur et al.'s (1995) study. They reported that employee organisational commitment was the strongest predictor of employee approval of Lean and concluded that it "is of primary importance and should be included in a model that seeks to explain the adoption of Japanese manufacturing practices such as those embodied in Lean production" (p. 1418).

Employees who feel committed to their organisation are more likely to participate voluntarily in continuous improvement activities such as suggestion schemes and quality circles, and to engage in problem-solving (Adler, 1993a; De Treville & Antonakis, 2006; Shadur et al., 1995; Wickens, 1987). According to Emiliani (1998), "many of the consequences of fat behaviours relate to the loss of employee commitment" (p. 624). Despite these observations, no research has explicitly examined the links between organisational commitment, attitudes towards adopting LBs and employee intentions to perform LBs, a research gap addressed in the present study ***(Research gap 4).*** Although Shadur et al. (1995) considered the relationship between commitment and employee receptiveness to Lean, they did not consider the interaction between commitment, attitudes and employee intentions to adopt LBs within the context of the TPB.

A trawl of the organisational change literature suggests that employees highly committed to their organisation tend to have positive attitudes to change, are more willing to accept different ways of working, and learn more effectively (Cordery et al., 1993; Mowday, 1998; Parker et al., 2006). Iverson (1996) even reports that, after union membership, organisational commitment is the second most important predictor of attitudes towards change. Highly committed employees are also more congruent with the goals and values of the organisation and demonstrate greater

willingness to expend effort on behalf of the organisation (Iverson, 1996; Wanous, Reichers, & Austin, 2000).

It is expected that organisational commitment will be positively related to attitudes and intentions to adopt LBs. However, based on TPB theory, attitude is expected to mediate the positive relationship between organisational commitment and intentions - people who are more committed to their organisation will have more positive attitudes towards their adoption of LBs which will translate into stronger intentions to engage in LBs.

H7: Attitudes to adopting LBs will mediate the positive relationship between organisational commitment and intentions to adopt LBs.

2.5.2.1.3. Lean Self-efficacy (LSE)

Cervone (2000) argues that despite beliefs about what causes "outcomes or the contingencies between responses and outcomes in the environment, [individuals] are unlikely to take action to control events if they doubt their own capacity to execute requisite behaviours" (p. 31). Decisions involving choice of activities, preparation for activities, effort expended during engagement and emotional reactions are partly attributable to judgments of perceived self-efficacy (Bandura, 1997). Self-efficacy is the subjective probability and belief that one is capable of successfully performing the behaviours for a specific task (Bandura, 1977, 1982).

Self-efficacy is an important predictor of motivation and behaviour and "influences individual choices, goals, emotional reactions, effort, coping, and persistence" (Gist & Mitchell, 1992, p. 186). Judge and Bono's (2001) meta-analysis demonstrated a positive relationship between self-efficacy and work performance; and self-efficacy, even in unsuccessful performances, can positively predict future behaviour (Silver, Mitchell, & Gist, 1995). Employees who feel confident about performing particular tasks will persist at them despite adversity, will perform them better, will cope more effectively in a change situation requiring them to perform the tasks, and will adopt more efficient task strategies (Hill, Smith & Mann, 1987; Lent, Brown & Larkin, 1987; Wood, George-Falvy & Debowski, 2001). Of particular relevance to the

current study, a fairly recent meta-analysis of the TPB demonstrated that self-efficacy is a strong predictor of intentions and behaviour (Armitage & Conner, 2001a), and research suggests that self-efficacy is crucial for proactive employee behaviours such as using one's initiative and taking charge (Morrison & Phelps, 1999; Speier & Frese, 1997).

Self-efficacy is similar to PBC. Both constructs are concerned with control - the belief that one is capable of performing the behaviour (self-efficacy), and the perceived ease or difficulty of performing the behaviour (PBC). Although Ajzen (1991) claims that PBC and self-efficacy are synonymous, a number of authors argue that they are distinct concepts and that one way to distinguish between them is to consider control as manifesting itself in two forms: Internal control (self-efficacy), which is based upon factors originating from within the individual (such as knowledge, skills, abilities and motivation); and external control (PBC), which relates to factors outside the individual (such as access to necessary resources, cooperation of others, and opportunities) (Bandura, 1992; Manstead & Van Eekelen, 1998; Terry 1993; Terry and O'Leary, 1995; White, Terry & Hogg, 1994). Empirical research covering diverse behaviours from food choice to exercise supports this distinction (Armitage & Conner, 1999a; Armitage, Conner, Loach & Willetts, 1999; Conner & Armitage, 1998; Dzewaltowski, Noble & Shaw, 1990; Manstead & Van Eekelen, 1998; McCaul, Sandgren, O'Neill & Hinsz, 1993; Povey, Conner Sparks, James & Shepherd, 2000; Sparks, Guthrie & Shepherd, 1997; Terry & O'Leary, 1995; Trafimow, Sheeran, Conner & Finlay, 2002; White et al. 1994). Povey et al. (2000) argue that "future examinations of the TPB would benefit from treating the variables of self-efficacy and perceived control as separate concepts" (p. 136).

Building on Bandura's self-efficacy theory, Parker (1998) developed the 'Role-Breadth Self-Efficacy' (RBSE) concept, which is defined as the extent to which employees "feel confident that they can carry out a broader and more proactive role, beyond traditional prescribed technical requirements" (p. 835). Based on the work of Bateman and Crant (1993) and Frese, Kring, Soose, and Zempel (1996), Parker (2000) defines proactivity as "acting on the environment in a self-directed way to bring about changes, such as by showing initiative, preventing problems, and scanning for opportunities" (p. 451). Parker (1998) argues that a prerequisite for

employees behaving proactively is that they feel *confident* about, and *capable* of, engaging in those behaviours. In a later publication, Parker et al. (2006) argue that "there was support for the idea that engaging in proactive behaviour involves rational decision-making about whether such actions will be successful, with a critical assessment being one's personal capability to engage in a range of relevant activities (role breadth self-efficacy)" (p. 645).

RBSE is factorially distinct from job satisfaction, organisational commitment, self-esteem and proactive personality (Parker, 1998, 2000). It is an important concept to consider in a study seeking to understand employee motivation for Lean because, similar to self-efficacy, it can change in response to situational change and interventions (Parker, 1998, 2000). Studies have shown how various training methods can enhance self-efficacy (Frayne & Latham, 1987; Gist, 1989; Gist, Schwoerer & Rosen, 1989; Wood & Bandura, 1989) and people's confidence to accept a more proactive and interpersonal role within the workplace (Axtell & Parker, 2003). If the present research shows self-efficacy to predict employee intentions to adopt LBs, this would clearly carry an important practical message to organisations implementing Lean.

Consistent with Bandura's (1982, 1986) definition of self-efficacy, RBSE focuses on peoples' perceptions that they can perform tasks and activities, rather than whether they actually perform them. As discussed in Section 2.4, a cross-section of staff from a glass manufacturing company were interviewed to identify non-technical activities they felt were increasingly important for them to perform to be effective in their job. It was based on these interviews that Parker (1998) developed the RBSE measure, which contains the proactive, interpersonal and integrative behaviours listed in Table 2.4. These behaviours, although not labelled by Parker as Lean, could be classed as such. This measure does, however, only capture some LBs and, as discussed in Section 2.4, the work of other authors (Appelbaum & Batt, 1994; Berggren, 1993; Forza, 1996; Jackson et al., 1993; Krafcik, 1988; MacDuffie, 1995; Niepce & Molleman, 1998; Rees et al.,1996; Womack et al., 1990) suggests that suggestion-making, problem-solving, participative decision-making, teamworking, autonomous working, job rotations, multi-skilling, volunteering for extra-job activities and maintaining a neat, tidy and safe workplace constitute the main LBs. Incorporating

all these LBs widens Parker's (1998) RBSE construct. Lean self-efficacy (LSE) is considered a more accurate description for this expanded construct and will be the term used hereafter to reflect employee confidence to adopt LBs.

The current study is the first to investigate the relationship between LSE and employee intentions to adopt LBs ***(Research gap 5)***. It is, however, possible to generate hypotheses related to LSE by drawing on studies which have measured RBSE and general self-efficacy.

Past research suggests that RBSE is linked to making suggestions for improvement (Axtell et al., 2000), proactive and innovative behaviour (Axtell & Parker, 2003; Griffin, Neal & Parker, 2007; Parker et al., 2006) and knowledge management behaviour (Cabrera et al., 2006). People scoring high on general self-efficacy tend to make more suggestions for work improvement (Frese et al., 1999). Research also shows that a person's willingness for change is significantly related to their RBSE (Parker, 2000) and self-efficacy to change jobs (Cunningham et al., 2002).

Considering this evidence, LSE and intentions to adopt LBs are expected to be positively related. However, based on Ajzen's (1991) argument that the influences of non-TPB variables on intentions are expected to be mediated by TPB variables, PBC and attitude are hypothesised to each partially mediate the LSE-intentions relationship. This is because PBC and self-efficacy are conceptually closely linked, and because individuals who feel confident in their ability to engage in particular behaviours tend to have more positive attitudes towards adoption of those behaviours (Bandura, 1982; Thoms, Moore & Scott, 1996).

H8: PBC will partially mediate the positive relationship between LSE and intentions to adopt LBs.

H9: Attitude will partially mediate the positive relationship between LSE and intentions to adopt LBs.

2.5.2.1.4. Past Behaviour

Norman and Conner (2006) argue that, "despite the successful application of the TPB across a wide range of behaviours, a major shortcoming of the model is its inability to fully account for the influence of past behaviour on intention and future behaviour. Past behaviour is typically the strongest predictor of intention and behaviour, explaining variance over and above that accounted for by the TPB variables" (p. 57). Sutton (1994) also claims that past behaviour can be a better predictor of future behaviour than the cognitive constructs contained within the TPB. A number of empirical studies demonstrate that past behaviour predicts future behaviour (Ajzen, 1991; Bagozzi & Kimmel, 1995; Chorlton, 2007; Elliott, Armitage & Baughan, 2003; Norman & Conner, 2006; Norman & Smith, 1995; Ouellette & Wood, 1998; Sutton, 1994). Meta-analytic reviews by Conner and Armitage (1998) showed that past behaviour has strong correlations with all the TPB variables as well as with future behaviour, and that, after taking account of attitude, subjective norms and PBC, past behaviour explained on average a further 7.2% of the variance in intentions. Equally, after taking account of intentions and PBC, past behaviour explained an additional 13% of the variance in behaviour. The authors concluded that these results are unlikely to be solely attributable to methodological factors but rather indicate either the importance of assessing past behaviour or the possibility that responses to the past and future behaviour measures were attributable to some other socio-cognitive construct. They suggest that "future studies might usefully include measures of past behaviour in order to further examine the extent to which its impact on intentions and behaviour is mediated by TPB variables" (p. 1438).

The present research addresses this call for further work by exploring within the context of LBs how past behaviour relates to each of the TPB variables and future behaviour ***(Research gap 6)***. Past behaviour is expected to positively relate to employee intentions to adopt, and future employee engagement in, LBs. However, it is also expected to positively relate to PBC, attitudes and subjective norms based on Conner and Armitage's (1998) findings and because these TPB predictors are, according to Ajzen,(1991), residues of past behaviour. PBC reflects salient beliefs about how easy it would be to perform the behaviour as determined by the perceived opportunities and resources available which fall beyond a person's internal control.

Individuals who are already engaging in a particular behaviour or who have done so in the past are likely to have overcome any obstacles to such engagement and to thus perceive greater PBC. Ajzen (1991) argues that the effect of past behaviour on intentions should be mediated by PBC, and research has reported a positive past behaviour-PBC relationship (Conner & Abraham, 2001; Conner & Armitage, 1998; Conner & Godin, 2007; Ouellette & Wood, 1998).

The expected positive past behaviour-attitude relation is partly based on Festinger's (1957) cognitive dissonance theory. This states that psychological discomfort exists when an individual holds a cognition or behaves in a manner inconsistent with his or her other cognitions or behaviours in the same domain. The individual attempts to avoid such discomfort by aligning, where possible, associated attitudes and behaviours. Forming a positive attitude towards a behaviour that an individual is already performing could help achieve consistency between cognitions and behaviour and avoid psychological discomfort. The same argument can be offered for the hypothesised positive subjective norm-past behaviour relation. Believing that others significant to the individual would approve of their engagement in behaviours that they are already performing is psychologically more acceptable than believing that they would disapprove. Previous research indicating that past behaviour positively relates to attitudes and subjective norms lends further support for these hypothesised relationships (Conner & Abraham, 2001; Conner & Armitage, 1998; Conner & Godin, 2007; Norman & Conner, 2006).

H10: The more that employees have engaged in LBs in the past, the stronger will be their intentions to adopt LBs.

H11: The more that employees have engaged in LBs in the past, the more positive will be their attitudes towards adopting LBs.

H12: The more that employees have engaged in LBs in the past, the more positive will be their subjective norms to adopt LBs.

H13: The more that employees have engaged in LBs in the past, the greater will be their PBC with respect to adopting LBs.

H14: The more that employees have engaged in LBs in the past, the greater will be their future engagement in LBs.

Past engagement in LBs is expected to positively relate to LSE because individuals who have already engaged in particular sets of behaviours tend to report greater self-efficacy to perform similar behaviours in the future (Bandura, 1982, 1997). Research also suggests that higher levels of RBSE tends to be reported among employees who are members of improvement groups, who engage in proactive work behaviours and who perceive their jobs to be autonomous and to require a variety of skills (Axtell & Parker, 2003; Parker, 2000; Parker et al., 2006).

H15: The more that employees have engaged in LBs in the past, the greater will be their LSE.

2.5.2.1.5. Union Membership

Kumar and Holmes (1997) argue that whatever the idealised vision of Lean, workplace innovation is highly dependent upon the union response. Rutherford (2004), Eaton and Voos (1992) and Lee (2003) all recognise the important role unions play in the successful implementation of Lean. It was therefore deemed appropriate to explore the relationship between union membership and employee attitudes towards adopting LBs, a research area yet to be explored (***Research gap 7).***

Resistance to Japanese management systems such as Lean was widespread within the Canadian Auto Workers' (CAW) union, the leading oppositional union to Lean - "we reject the use of Japanese Production Methods which rigidly establish work standards and standard operations thereby limiting worker autonomy and discretion on the job. We reject the use of techniques such as Kaizen (pressure for continuous 'improvement') where the result is speed-up, work intensification and more stressful jobs" (CAW Research Department, 1989, p. 12, cited in Berggren, 1992). Evidence also suggests that most of the employee resistance to Lean reported in the Japanese auto transplants in North America was from union members (Berggren, 1993; Black & Ackers, 1994) and that union members are more reluctant to participate in employee involvement programmes than non-union members (Cooke, 1990).

Union resistance to Lean is evident in the UK. After the introduction of Lean in the Civil Service, members of the Public and Commercial Service's (PCS) Union at Her Majesty's Revenue and Customs (HMRC) processing centre in Lothians, Scotland, went on strike in April 2006 over Lean working practices (http://www.pcs.org.uk/en/news_and_events/news_centre/archived_news.cfm/id/0BF4D000-771F-4027-A759877D06198135). Some 8000 PCS union members voted to take industrial action against the introduction of Lean in ten other HMRC processing offices across the UK.

Resistance to Lean in Europe has often come from the Unions, who have objected to the flexible work practices and reduced job classifications that are hallmarks of Lean (Holmes & Schmitz, 1995). Union resistance to Lean has been noted by Dore (2000), Stewart and Wass (1998) and Rutherford (2004). The change literature suggests that union members are more likely to resist change than non-union members (Barling, Fullager & Kelloway, 1992) and that "the most important determinant of acceptance of organisational change was that of union membership" (Iverson, 1996, p. 140). Based on this evidence, the following is proposed:

H16: Union members will have a more negative attitude towards their adoption of LBs than non-union members.

2.5.2.1.6. Organisational Tenure

The length of time an employee has worked for their organisation is an important variable to consider because it has been linked to employee reactions to improvement initiatives and to employee receptiveness to change. Empirical research by Stewart and Wass (1998) indicated that employees with longer tenure were significantly more likely to have negative attitudes to new management strategies such as Lean, and to resist change than employees with shorter tenure. Research suggests that an employees' tenure and their practice of TQM behaviours are negatively related (Ehigie & Akpan, 2005). Both Parker (2000) and Iverson (1996) found organisational tenure and employee resistance to change to be positively related, and Katz (1982) demonstrated that longer organisational tenure was associated with

increased rigidity and greater attachment to established policies and practices. Based on these findings, the following is expected.

H17: Organisational tenure and attitude to adopting LBs will be negatively related.

2.5.2.1.7. Employee Level

It is important to consider employee level because of the different job characteristics and attitudes to change between managers and non-managers. Within traditional organisational structures, LBs such as suggestion-making, problem-solving, and decision-making are usually performed by managers (Womack et al., 1990). Furthermore, compared to non-managers, managers are more likely to be members of improvement groups and to perceive their jobs as autonomous, and to afford skill and task variety (Axtell & Parker, 2003; Parker, 2000). The following is therefore expected:

H18: Managers will report greater past engagement in LBs than non-managers.

The current study will, unlike previous research, explore whether attitudes towards adopting LBs differ between managers and non-managers ***(Research gap 8).*** Managers are generally more positively disposed to change and rate their level of change self-efficacy higher than non-managers (Ahmad, 2000; Armstrong-Stassen, 1998; Martin, Jones & Callan, 2006; Parker, 2000). Literature also suggests that managers report higher RBSE than non-managers (Axtell & Parker, 2003) and individuals who feel confident in their ability to engage in particular behaviours tend to have more positive attitudes towards adoption of those behaviours (Bandura, 1982). This evidence leads to hypothesis 19.

H19: Managers will report a more positive attitude towards their adoption of LBs than non-managers.

2.5.2.2. Person-related Variables

2.5.2.2.1. Personality

The Five Factor Model (FFM) of personality, which has dominated personality research in recent decades, represents a robust taxonomy of personality traits at the highest hierarchical level of trait description that views human nature from the perspective of consistent and enduring individual differences (Digman, 1990; McCrae & John, 1992). It states that personality can be divided into five broad dimensions or traits known as *Neuroticism* (the tendency to experience emotions such as anxiety, stress, insecurity, tension, nervousness and worry), *Openness to experience* (how imaginative, inventive, original, curious, cultured, creative and broad-minded someone is), *Extraversion* (the extent to which a person is assertive, outgoing, talkative, adventurous, sociable, active, energetic), *Agreeableness* (how good-natured, appreciative, trusting, compliant, altruistic, flexible, tolerant, caring, and cooperative someone is) and *Conscientiousness* (the extent someone is responsible, thorough, organised, efficient, reliable, persevering, orderly, hard-working, task-focused and dependable). An individual's scoring against each of these traits is considered to remain relatively stable across the life course (Clark & Watson, 1999; McCrae, Costa, Ostendorf, Angleitner, Hrebickova, Avia, Sanz, Sánchez-Bernardos, Kusdil, Woodfield, Saunders, & Smith, 2000).

Most personality psychologists acknowledge the FFM as "necessary and sufficient to describe the structure of personality at a global level" (Mount, Barrick & Stewart, 1998, p. 146). When comprehensive sets of variables are factored, the FFM generalizes reliably across different methodological variations, measures, populations, sources of ratings, languages and cultures (Digman, 1990; Hogan, 1991; John, 1990; John & Srivastava, 1999; McCrae & Costa, 1987, 1997), thus supporting the FFM as a universal personality structure.

The links between personality and employee behaviour have been repeatedly demonstrated. A number of studies, some meta-analytic, have shown that personality can accurately predict the job performance, absenteeism and turnover of employees

of various occupational groups (Barrick & Mount, 1991; Barrick, Mount & Judge, 2001; Hurtz & Donovan, 2000; Salgado, 2003; Tett, Jackson & Rothstein, 1991).

Intuition suggests the relevance of personality to the current study. Lean requires individuals who are flexible and can work effectively in a team–based environment; who are conscientious and meticulous with their work to ensure that errors are avoided and only high quality products/services are pulled through the system; who are open to trying new, different ways of working; who are creative and generate innovative suggestions for improvement; and who thrive and feel emotionally at ease in an environment of ongoing change and continuous improvement.

Despite the power of the 'Big Five' and its links to employee behaviour, there is no research exploring the influence of personality on employee attitudes towards adopting the full range of LBs, a research gap bridged by the current study ***(Research gap 9)***. There is, however, research suggesting that people who score high on extraversion and low on neuroticism are significantly more likely to comply with TQM practices (Ehigie, Akpan & Okhakhume, 2006).

To facilitate hypothesis generation, research that has explored the relationships between personality traits and employee engagement in the individual behaviours typically classed as Lean will be reviewed. This research is of relevance because individuals tend to be more receptive to situations that enable expression of their personality (Ickes, Snyder & Garcia, 1997).

Table 2.5 contains, in rows, most of the key LBs and a 'willingness for/attitude towards organisational change' item. In the columns are the five personality traits and a list of studies that have reported links between the traits and engagement in/willingness to adopt, the Lean behaviour. The sample sizes and types of participants are also reported. The table details whether the studies reported a positive or negative relationship between the trait and the behaviour/willingness for change item. Although the studies varied in their research objectives, measures, analyses, and participants, a clear pattern emerges. People scoring high on openness, conscientiousness, extraversion and agreeableness, and low on neuroticism tend to

Table 2.5: The 'Big Five' – openness (O), conscientiousness (C), extraversion (E), agreeableness (A) and neuroticism (N) - and Employee Engagement in LBs.

	Personality Trait					Studies		
	O	C	E	A	N	Authors	Sample Size	Types of Participants
Teamworking		+	+	+	-	LePine and Van Dyne (2001)	276	Students on management course
		+	+	+	-	Barrick, Stewart , Neubert and Mount (1998)	652	Manufacturing personnel
		+	+	+	-	Thoms et al. (1996)	126	Manufacturing and support personnel
		+	+			De Jong, Bouhuys and Barnhoorn (1999)	58	Management in banking organisation
		+		+	-	Mount et al. (1998)	1586 in meta-analysis of 11 studies	Various but mainly service employees
		+	+	+		Morgeson, Reider and Campion (2005)	90	Manufacturing personnel
Goal/target-setting					-	Malouff, Schutte, Bauer and Mantelli (1990)	153	Students
		+	+		-	Barrick, Mount and Strauss (1993)	91	Sales representatives
		+				Gellatly (1996)	117	Business students
	+	+	+	-	-	Judge and Ilies (2002)	Meta-analysis of 65 studies. From 262 to 2780 for different traits.	Various due to meta-analysis
Problem-solving	+	+	+	+	-	Bastian, Burns and Nettelbeck (2005)	246	Tertiary students
			+			Barry and Stewart (1997)	289	Graduate students
Employee autonomy/ empowerment	+					Furnham, Petrides, Tsaousis, Pappas and Garrod (2005)	530	Service employees
	+					Williams (2004)	208	Non-academic university employees
	+			+		Stevens and Ash (2001)	302	Undergraduate students
Participative decision-making	+			+		Stevens and Ash (2001)	302	Undergraduate students
Multi-skilling and motivation for skill acquisition/learning		+			-	Colquitt, LePine and Noe (2000)	Total sample size not reported but meta-analysis of 106 studies.	44 studies in business organisations, 21 military studies, 41 lab studies
	+	+	+			Barrick and Mount (1991)	23,994. Meta-analysis of 117 studies	Professionals, police, managers, sales, skilled/semi-skilled workers
		+				Colquitt and Simmering (1998)	103	Undergraduate business students
Job rotation					-	Karuppan (2004)	162	Machine operators
Volunteering for extra-role activities		+		+		Organ and Ryan (1995)	Meta-analysis of 55 studies	Various due to meta-analysis
		+		+	-	Borman, Penner, Allen and Motowidlo (2001)	Meta-analysis of 25 studies. From 1151 to 2378 for different traits.	Various due to meta-analysis
Willingness for/attitude towards organisational change	+	+	+	+	-	Vakola et al. (2004)	137	Professionals
	+	+				Griffin and Hesketh (2005)	375	Service employees

demonstrate greater engagement in/motivation for LBs, and tend to be more receptive to organisational change.

The researcher was unable to locate any studies that explicitly looked at the links between personality and having a neat, tidy and safe workplace, but one of the conscientiousness items in Costa and McCrae's (1992) personality inventory, the NEO, is "I keep my belongings clean and neat." Other authors argue that conscientiousness is linked to keeping one's environment neat and organised (Burke, Matthiesen & Pallesen, 2006; Manley, Benavidez & Dunn, 2007; Organ, 1994).

Suggestion-making is a key Lean behaviour. In Organ and Ryan's (1995) meta-analysis of the attitudinal and dispositional predictors of organisational citizenship behaviours, most of the studies they reviewed used Smith, Organ and Near's (1983) measure of organisational citizenship behaviour. One of the items in this measure concerns suggestion-making ('Makes innovative suggestions to improve department'). Organ and Ryan (1995) found that employee engagement in organisational citizenship behaviour was related to high levels of conscientiousness and agreeableness. It is likely that suggestion-making is positively related to these traits.

Cabrera et al. (2006) investigated the determinants of knowledge-sharing behaviour, which is characterised by employees sharing their improvement ideas and experiences with fellow colleagues. Agreeableness, conscientiousness and openness were all significantly positively related to knowledge sharing. Wang and Yang (2007) reported that extraversion, agreeableness and conscientiousness were positively related to individuals' intentions to knowledge share.

Until recently, there had been relatively few studies on how personality integrates with socio-cognitive models such as the TPB, leading several authors to call for such research (Burmudez, 1999; Conner & Abraham, 2001; Hampson, 1999). Philips, Abraham and Bond (2003) argue that combining personality and TPB research should lead to a more sophisticated understanding of the processes by which personality influences behaviour, and of the cognitive roots of behaviour.

In their study of the determinants of University students' examination performance, Philips et al. (2003) reported that openness and conscientiousness were direct predictors of intentions over and above the TPB variables. Courneya, Bobick and Schinke (1999) explored the links between personality, the TPB and exercise behaviour. They found that, although the TPB mediated the impact of conscientiousness and neuroticism on behaviour, extraversion had a direct effect on behaviour after controlling for the TPB variables. Rhodes and Courneya (2003) reported that the activity facet of extraversion had a significant effect on exercise behaviour while controlling for the TPB. Conner and Abraham (2001) investigated whether the TPB constructs mediated the effects of personality traits on self-reported behaviours (health protection and exercise). The conscientiousness-behaviour relationship was only partially mediated by attitude and a direct relationship remained after taking account of the other TPB variables, leading the authors to conclude that a measure of conscientiousness should be included in tests of the TPB. Norman and Conner (2005) even argue that conscientiousness could be one of the most significant moderators of the intentions-behaviour relationship - conscientious individuals tend to be more motivated to achieve their ambitions and consequently they may feel more committed to fulfil their intentions which could translate into greater engagement of behaviours perceived as difficult.

Several fairly recent studies have investigated whether personality moderates the relationships between the TPB constructs and intentions. Within the exercise domain, Rhodes, Courneya and Hayduk (2002) reported that neuroticism and extraversion moderated the influence of subjective norm on intentions. Individuals higher in neuroticism and lower in extraversion had stronger subjective norm-intentions relations than individuals lower in neuroticism and higher in extraversion. Conscientiousness moderated the affective attitude-intentions relationship, with individuals lower on conscientiousness having a stronger affective attitude-intentions relationship than individuals higher on conscientiousness. Extraversion and conscientiousness moderated the intentions-behaviour relationship. Individuals scoring higher on these personality traits had stronger intentions-behaviour relations than their less extraverted and less conscientious counterparts.

Also in the exercise domain, Rhodes, Courneya and Jones (2004) reported that the activity trait of extraversion had a significant direct effect on exercise intentions and behaviour while controlling for the TPB. In a subsequent study, Rhodes, Courneya and Jones (2005) showed that personality significantly moderated the relationship between the TPB predictors, intentions and exercise behaviour. Industriousness-ambition (a lower order trait of conscientiousness) moderated the effect of intentions on behaviour while irritability (a lower order trait of neuroticism) moderated the effect of affective attitude on behaviour. Insecurity (a lower order trait of neuroticism) moderated the effect of subjective norm on intentions while activity-adventurousness (a lower order trait of extraversion) moderated the effect of PBC on intentions. The inclusion of personality actually explained an additional 8% and 9% of the variance in behaviour and intentions, respectively.

Evidently, to gain a more holistic understanding of the motivators of behaviour, researchers should include measures of both personality and TPB variables. Past research on the TPB-personality interaction has mainly focussed on health behaviours, particularly exercise behaviour, which are generally more under the individual's volitional control and, in some circumstances, less social than LBs. This research therefore sheds limited light on how personality and the TPB variables are likely to interact with respect to employee engagement in LBs. The current study therefore seeks to explore such interactions. The evidence presented at the beginning of this section is, however, used to guide hypotheses relating to personality and attitude.

H20: Openness and attitude towards adopting LBs will be positively related.

H21: Conscientiousness and attitude towards adopting LBs will be positively related.

H22: Extraversion and attitude towards adopting LBs will be positively related.

H23: Agreeableness and attitude towards adopting LBs will be positively related.

H24: Neuroticism and attitude towards adopting LBs will be negatively related.

Generalised self-efficacy represents a relatively enduring belief about how well one can perform across a variety of situations and tasks (Chen, Gully & Eden, 2001). Meta-analyses by Judge, Erez, Bono and Thoresen (2002) and Judge and Ilies (2002) reported that generalised self-efficacy correlated positively with conscientiousness, agreeableness, openness and extraversion and negatively with neuroticism.

Thoms et al. (1996) investigated the relationship between the 'Big Five' and self-efficacy for participating in self-managed work groups. Tasks included in their self-efficacy scale included some of the behaviours employees in organisations implementing Lean are expected to adopt (teamworking, problem-solving, decision-making). Employees scoring high on extraversion, agreeableness and conscientiousness and low on neuroticism were significantly more likely to report self-efficacy for participating in self-managed work groups.

Given that the RBSE construct is relatively new, there is, to the researcher's knowledge, only one study which has explored the relationship between personality and RBSE. In their investigation into the determinants of employee knowledge sharing behaviour, Cabrera et al. (2006) found that RBSE had a significant positive relationship with openness but virtually no relationship with agreeableness and conscientiousness. Extraversion and neuroticism were not measured. Although this study sheds some light on the personality-RBSE relationship, it fails to consider all five personality constructs. The present research seeks to build on this past work by exploring the relationship between all five personality traits and the broader concept of LSE (***Research gap 10***). Taking the evidence presented above as a whole and considering the findings from the meta-analyses on generalised self-efficacy and personality, the following hypotheses are proposed:

H25: LSE will be positively correlated with openness.

H26: LSE will be positively correlated with conscientiousness.

H27: LSE will be positively correlated with extraversion.

H28: LSE will be positively correlated with agreeableness.

H29: LSE will be negatively correlated with neuroticism.

2.5.2.2.2. Gender

Although there is one study suggesting that females are generally more committed to quality initiatives than males (Jackson, 2004), the researcher is unaware of any literature on gender and employee attitudes towards adopting LBs ***(Research gap 11)***. Research examining the role of gender in employee readiness for organisational change yields inconsistent findings, with one study reporting no relationship (Cordery et al., 1993), and another that females are more accepting of change than males (Iverson, 1996). Cordery, Barton, Mueller and Parker (1992) reported that males were more likely to resist change when they perceived the change to require their adoption of traditionally female behaviours. Arguably some of the behaviours falling under the umbrella of Lean (teamworking, volunteering for extra-role activities, job rotation) could be perceived as feminine. Based on this argument, the following is proposed:

H30: Females will report a more positive attitude towards their adoption of LBs than males.

2.5.2.2.3. Age

It is important to consider employee age in the current study because age is negatively related to employee acceptance of change and, compared to their younger counterparts, older employees are less likely to propose changes to working methods and techniques and tend to feel more threatened by having to adopt new responsibilities and engage in new work methods (Axtell et al., 2000; Cordery et al., 1992, 1993; Mann, 1995). Compared to older workers, younger workers are also more likely to participate in employee involvement programmes (Miller & Pritchard, 1992). The present research is, to the researcher's knowledge, the first to explicitly investigate whether age is linked to employee attitudes towards adopting LBs ***(Research gap 12).***

H31: Age and attitude to adopting LBs will be negatively related.

2.5.2.3 Excluded Non-TPB Variables

Research has shown that a number of other non-TPB variables not considered thus far are capable of explaining variance in intentions and behaviour. These include *affect* – the emotions a person feels in relation to the behaviour (Lawton, Conner & Parker, 2007; Lawton, Parker, Manstead & Stradling, 1997; Trafimow, Lombardo, Finlay, Brown & Armitage, 2004); *self-identity* – "the extent to which an actor sees him-or herself as fulfilling the criteria for any societal role" (Conner & Armitage, 1998, p. 1444) (Armitage & Conner, 2001b; Conner & Armitage, 1998; Conner, Warren, Close & Sparks, 1999; Sparks & Shepherd, 1992; Terry, Hogg & White, 1999); *moral norms* – an individual's feelings of moral obligation or responsibility towards performance or non-performance of a behaviour (Armitage & Conner, 2001a; Conner & Armitage, 1998; Conner, Smith & McMillan, 2003; Manstead, 2000; McMillan, Higgins & Conner, 2005); *anticipated regret* - an individual's evaluation of the potential negative affective reactions of engaging in a behaviour (Conner & Abraham, 2001; Conner, Graham & Moore, 1999); *perceived susceptibility* – an individual's perceptions of risk of performing or not performing a behaviour (Milne, Sheeran & Orbell, 2000; Orbell & Sheeran, 1998); and *attitudinal ambivalence* - mixed evaluations of, or feelings towards, an attitude object (Sparks, Conner, James, Shepherd & Povey, 2001). To keep the research focused and the data collection tool sufficiently parsimonious to entice participation from a reasonable number of people, these constructs were excluded from the current study. The constructs selected for inclusion were considered more relevant to LBs and the objectives of the research. According to Conner and Armitage (1998), the combination of variables selected for inclusion in a TPB study should be dependent upon the nature of the behaviour and the purpose of the study.

2.6 Summary of Hypotheses and Research Questions

The literature review suggests that there has been relatively little research on the employee motivational aspects of Lean. The study seeks to contribute to knowledge in this area by addressing 12 research gaps and the 31 hypotheses summarised in Table 2.6. The study has 5 overarching research questions (see Table 2.7). Research Question 3 is a broad research objective and concerns the sufficiency of the TPB in

explaining the impact of non-TPB variables on intentions and behaviour. It is considered highly relevant to the current study because the TPB has been selected as the core theoretical model for understanding employee intentions to adopt, and employee engagement in, LBs and addressing this research question will add to academic debates about whether the TPB variables mediate the effects of non-TPB variables on intentions and behaviour. All hypotheses and research questions will be tested to help gain a holistic understanding of the individual-level antecedents of employee motivation for Lean. The next chapter discusses philosophical aspects of research, provides some justifications for the selection and rejection of data collection methods and measures, and discusses the rationale for selecting the organisations for the study.

Table 2.7: Overarching Research Questions

Overarching Research Questions
1. What are the beliefs of employees regarding the outcome of their adoption of LBs, and to what extent does the strength of those beliefs vary according to whether an employee reports intentions to adopt LBs?
2. To what extent can Ajzen's (1991) TPB explain employee intentions to adopt, and future employee engagement in, LBs?
3. To what extent are non-TPB variables (job-related and person-related) predictors of employee intentions to adopt, and future employee engagement in, LBs independent of the TPB predictors?
4. To what extent is LSE related to the 'Big Five' personality traits?
5. With respect to LBs, how does personality interact with the TPB variables?

Table 2.6: Summary Table of Hypotheses

	Hypotheses
H1	The more positive are employees' attitudes towards their adopting of LBs, the stronger will be their intentions to engage in LBs
H2	The more positive are employees' subjective norms to adopt LBs, the stronger will be their intentions to engage in LBs
H3	The higher are employees' PBC with respect to adopting LBs, the stronger will be their intentions to engage in LBs
H4	Intentions and future employee engagement in LBs will be positively related
H5	PBC will have a direct relationship with future engagement in LBs independent of intentions
H6	Attitudes to adopting LBs will mediate the positive relationship between job satisfaction and intentions to adopt LBs
H7	Attitudes to adopting LBs will mediate the positive relationship between organisational commitment and intentions to adopt LBs
H8	PBC will partially mediate the positive relationship between LSE and intentions to adopt LBs
H9	Attitude will partially mediate the positive relationship between LSE and intentions to adopt LBs
H10	The more that employees have engaged in LBs in the past, the stronger will be their intentions to adopt LBs
H11	The more that employees have engaged in LBs in the past, the more positive will be their attitudes towards adopting LBs
H12	The more that employees have engaged in LBs in the past, the more positive will be their subjective norms to adopt LBs
H13	The more that employees have engaged in LBs in the past, the greater will be their PBC with respect to adopting LBs
H14	The more that employees have engaged in LBs in the past, the greater will be their future engagement in LBs
H15	The more that employees have engaged in LBs in the past, the greater will be their LSE
H16	Union members will have a more negative attitude towards their adoption of LBs than non-union members
H17	Organisational tenure and attitude to adopting LBs will be negatively related
H18	Managers will report greater past engagement in LBs than non-managers
H19	Managers will report a more positive attitude towards their adoption of LBs than non-managers
H20	Openness and attitude towards adopting LBs will be positively related
H21	Conscientiousness and attitude towards adopting LBs will be positively related
H22	Extraversion and attitude towards adopting LBs will be positively related
H23	Agreeableness and attitude towards adopting LBs will be positively related
H24	Neuroticism and attitude towards adopting LBs will be negatively related
H25	LSE will be positively correlated with openness
H26	LSE will be positively correlated with conscientiousness
H27	LSE will be positively correlated with extraversion
H28	LSE will be positively correlated with agreeableness
H29	LSE will be negatively correlated with neuroticism
H30	Females will report a more positive attitude towards their adoption of LBs than males
H31	Age and attitude to adopting LBs will be negatively related

Chapter 3 – Methodology

3.1. Introduction

The literature review has identified 12 research gaps, generated 31 hypotheses and outlined 5 research questions. Self-completion questionnaires supplemented with structured interviews were the data collection methods selected for the study. Philosophical perspectives about what constitutes valid knowledge about human action are reviewed in the present chapter to enable the reader to appreciate why these data collection methods were favoured and others rejected. Justifications for the selection and rejection of specific measures and scales for the questionnaire are presented and the rationale for selecting the organisations for the study is provided.

3.2. Research Paradigms

Guba and Lincoln (1994) define a paradigm as a basic set of beliefs that guide action, encompassing the highly interconnected concepts of ontology, epistemology and methodology. Ontology raises questions regarding the true nature of reality and human behaviour, and is the enquiry into the structure of existence. Epistemology reflects the theory of knowledge and is concerned with what constitutes valid knowledge about human behaviour and the social world. Methodology concerns how such valid knowledge can be captured and how the enquirer explores whatever they believe can be known. The ontological and epistemological assumptions of the researcher partly drive the methodology selected for the study and hence methodology bridges the gap between philosophical perspectives and research findings (Morgan & Smircich, 1980). The three most widely accepted epistemological positions span a continuum with positivism at one end, naturalism at the other, and realism in between.

3.2.1. Positivism

Positivism is a philosophical position originating from the natural sciences and the scientific experiment (Guba & Lincoln, 1994) and is concerned with operational

definitions, measurement, quantification, causality, generalization and replicability. Through the generation and empirical testing of hypotheses and the application of advanced multivariate statistical techniques, it seeks to identify laws, based primarily on the collection of quantitative data from sample populations of the social phenomena under investigation, which can be generalized to explain the behaviour of a larger population (Wass & Wells, 1994). The positivist approach to research supports knowledge generation through logical deduction and one-way inquiry on the part of the researcher. The investigator and the investigated are regarded as independent entities and the investigator is assumed to be able to investigate the 'subject' or person under investigation without the influence of values and biases. Within the social sciences, positivism advocates experimental design and the collection of data via methods such as self-completion questionnaire surveys and structured interviews (Wass & Wells, 1994).

3.2.2. Naturalism

Naturalism sits in stark contrast to positivism, rejecting the scientific experiment as a model for conducting social research. From a naturalistic perspective, true data reflect a person's comprehension of their social world and explanation is defined as "the interpretative understanding of the causes of action on the part of the subject" (Wass & Wells, 1994, p. 13). The subject is considered key to determining what constitutes knowledge and reality, and their interpretation of the social world is treated as objective data. Hypotheses and theory are not specified prior to data collection. Instead, theory is formulated post field work and is firmly grounded in the data collected to reflect a person's own perceptions and not those of the researcher or wider academic community (Glaser & Strauss, 1967). Given the importance of the subject's interpretation in explanations and emphasis on seeing "through the eyes of the people you are studying" (Bryman, 1988, p. 61), the naturalist position advocates close involvement between researcher and subject, lending itself to methodologies such as the unstructured interview and workplace/participant observations.

3.2.3. Realism

From an ontological and epistemological perspective, realists tend to position themselves between the two extremes of positivism and naturalism. Realism asserts that knowledge constitutes the observable and the intangible, and human action can be explained by subjective interpretations and context specific tendencies rather than absolute laws. Realists claim that both qualitative and quantitative approaches are valuable and defend methodological pluralism and triangulation (Ackroyd, 2004; Denzin, 1970). The realist usually opts for a complete toolkit of techniques to explore the research questions, often in the context of a case study comprising of interviews, questionnaires and participant observations.

3.2.4 The Current Study: Ontological, Epistemological and Methodological Considerations

The ontological, epistemological perspective that best fits the researcher's beliefs about what constitutes knowledge/reality and how this should be accessed is positivism. The researcher believes that valid knowledge about human behaviour can be acquired by collecting primarily quantitative data from sample populations of the social phenomena under investigation. Hypotheses can be tested and laws generated which can, to an extent, generalise to explain the behaviour of larger groups of individuals. These beliefs probably stem from the researcher's academic background in Occupational Psychology, a discipline primarily driven by quantitative data collection methods and hypothesis generation/testing. Methodologies which support the positivistic paradigm (self-completion questionnaires and structured interviews) are selected for the study partly based on the researcher's epistemological beliefs. Other reasons for selecting these methodologies are discussed below.

Wass and Wells (1994) argue that methodological choices should not only be based on the researcher's view of science and reality but also on the intellectual discipline from which the research derives. The current study is mainly concerned with the application of social and occupational psychology theories to employee motivation for Lean. Much research within social and occupational psychology, and some within business and management, is positivist (Chapman, 1996/1997; Symon & Cassell,

2006), and the studies reviewed in Section 2.5.1.1 which applied the TPB to different employee behaviours all adopted a positivist perspective and used self-completion questionnaires.

Regression analysis is often used in studies applying the TPB (see Armitage & Conner, 2001a; Conner & Godin, 2007; Ouellette & Wood, 1998; Rhodes et al., 2005). Regression suffers from a lack of generalisability and inflated error rates when the sample size is too small (Bobko & Schemmer, 1984), which has led a number of authors to suggest various rules of thumb concerning the minimum ratio of participants to independent variables needed to generate an accurate regression model. Tabachnick and Fidell (2001) argue that the number of participants should be greater than or equal to $104 + m$ where m represents the number of independent variables. Pedhazur (1997) suggests participant to variable ratios of 15:1 or 30:1 when generalization is critical. Field (2000) also recommends a minimum 15:1 ratio. Hair, Anderson, Tatham and Black (1998) advocate a less conservative ratio of 5:1. The current study considers with some samples as many as 17 independent variables. Even assuming the 5:1 ratio would require a sample of 85. Self-completion questionnaires offer a time and cost-effective way of collecting large amounts of data[4]. Time and cost constraints are valid reasons for selecting data collection methods (Forza, 2002).

As will be discussed in Section 3.5.2, LBs were measured using a self-report measure. They could have been measured using participant observation. This is where "researchers attempt to utilize their observations together with theoretical insights to make seemingly irrational or paradoxical behaviour comprehensible to those within and beyond the situation being studied" (Burgess, 1984, p. 79). The two most popular observation techniques are *covert observation* (the researcher's role as an observer is completely concealed and the researcher becomes part of the group being studied) and *overt observation* (the researcher adopts a purely observational role and does not interact with those being observed). Not only is participant observation inconsistent with the researcher's positivist position, but the researcher

[4] As will become apparent in Chapters 4-7, Hair et al.'s (1998) ratio of 5:1 is assumed and where the sample size is not sufficiently large enough, regressions are not conducted.

has concerns regarding the robustness and validity of this data collection method for the study. The presence of the observer, whether covert or overt, could encourage employees to engage in LBs through a social desirability mechanism. It is also not feasible for any researcher to observe all behaviour and some, perhaps pertinent behaviour, may be performed out of sight, resulting in an incomplete observation. The idea of measuring employee behaviour using colleague/manager observation ratings was rejected on the grounds that there was potential for observational bias (e.g., employees engaging in LBs more when they are being observed) and it would have been very time consuming for the organisations.

There is a general consensus among psychologists that constructs such as attitudes, perceptions and personality are best measured through self-report instruments, and Parker et al. (2006) argue that "self-reports of cognitive-motivational states is quite appropriate" (p. 647). Although some authors claim that self-report personality data may be subject to enhancement biases not present in observer data (e.g., John & Robins, 1994), other authors (e.g., Funder, 1989) offer convincing arguments that self-judgments are more accurate than observer judgements. Armitage and Conner (1999b) also provide evidence of minimal social desirability effects on the relationships between the TPB constructs.

For these reasons, the principal data collection method selected for the study was employee self-completion questionnaire surveys. Forza (2002) argues that researchers tend to conduct three types of survey research. *Exploratory survey research* is usually undertaken in the early stages of research into a phenomenon to gain an initial insight into a topic to aid subsequent in-depth survey. *Confirmatory (explanatory) survey research* is employed when well-defined concepts, models and propositions are used to express knowledge of a phenomenon in a theoretical framework. Data collection serves to test the adequacy of the established concepts to understand the phenomenon. *Descriptive survey research* seeks to understand the significance of a phenomenon and describe its distribution in the population. As shown in Chapter 2, many of the concepts considered in the current study are well-established concepts. Confirmatory (explanatory) survey research is therefore the selected approach for the study. Figure 3.1 explains the confirmatory survey research process in detail.

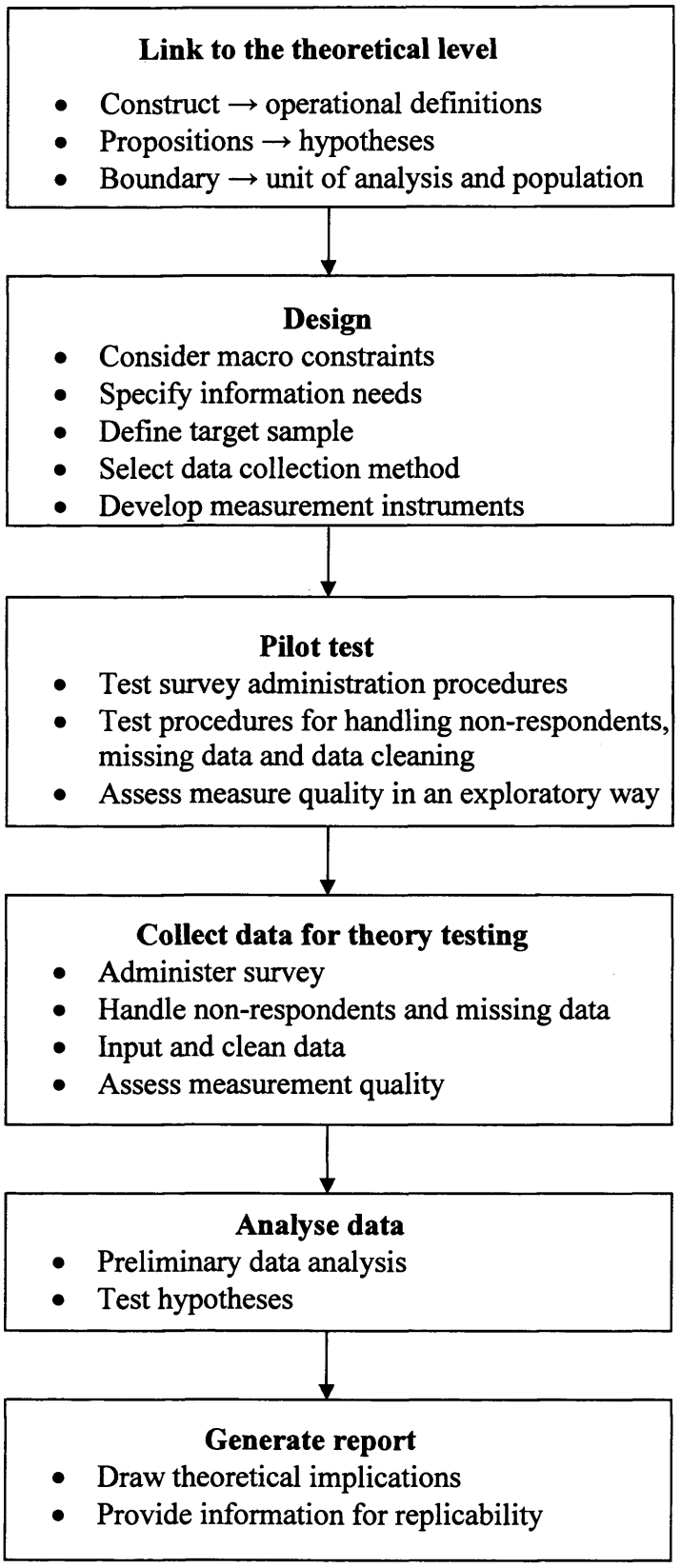

Figure 3.1: The Confirmatory Survey Research Process (From Forza, 2002).

3.3. Overall Research Process

Figure 3.2 summarises the overall research process adopted for the PhD and states the chapter in which the research stage is addressed. The literature review identified a number of research gaps, and led to the generation of hypotheses and research questions. The data collection instruments are developed and piloted. Following analysis of the pilot data, the instruments are refined, if necessary, for use in the main body of the research. Data will be collected from three organisations and analysed both within and across organisations. The results will be discussed in relation to the relevant literature, conclusions will be drawn and some practical implications, limitations and future research avenues will be discussed.

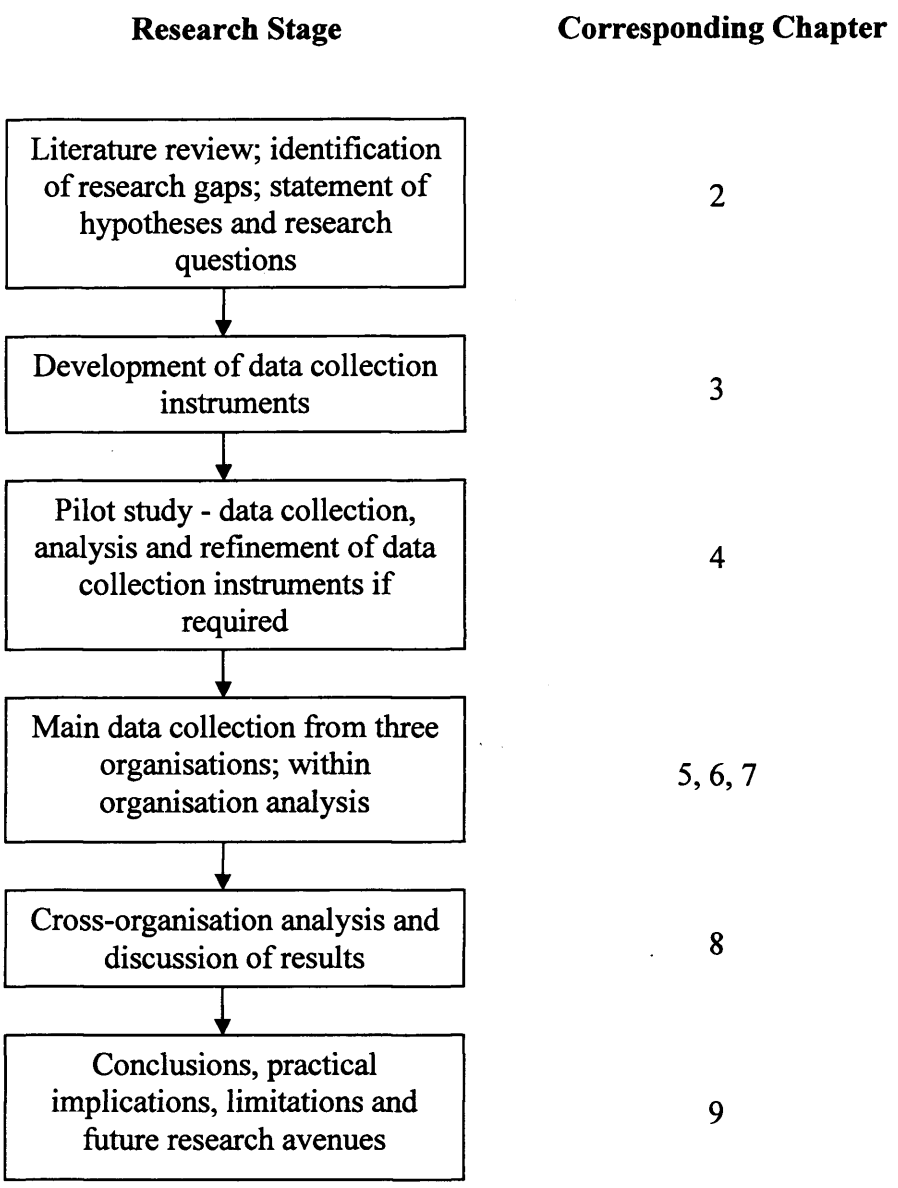

Figure 3.2: PhD Research Process

3.4. Participating Organisations

Data were collected from employees in four organisations - Rizla, Ivax, Arvin Meritor (abbreviated as Arvin from hereon) and Cardiff University (CU)[5]. Rizla, a cigarette paper manufacturer, served as the pilot and was used to test the survey administration/data collection procedure, and the quality of the measures. Ivax (a

[5] A senior member in each of the organisations agreed for the organisation's name to be used in the thesis.

pharmaceutical manufacturer), Arvin (a manufacturer of truck brake systems) and CU (a teaching and research institution) participated in the main body of the research. A member of senior management in each of these organisations identified the target sample as working in an environment that encourages its workers to adopt the LBs detailed in Section 2.4. This was considered necessary for their participation in the study because employees needed to be given the opportunity to perform LBs for a true test of the individual-level antecedents of employee engagement in LBs. Other valid reasons for selecting these organisations are discussed below.

The researcher undertook the study as a member of the research team at CU's Innovative Manufacturing Research Centre (CUIMRC). The Centre's remit is to assist in the recovery of the UK manufacturing sector by providing sustainable solutions research focused on the critically interrelated areas of business change, logistics and advanced manufacturing technologies. Organisations were approached and asked if they would like to become involved in one of the Centre's flagship projects, SUCCESS (Sustainable Channelled Change in Every Scale and Situation), which aimed to investigate the factors underlying a business' ability to implement and sustain change improvement initiatives such as Lean. Rizla, Arvin and Ivax all agreed to become partners of SUCCESS and expressed particular interests in understanding the employee motivational aspects of Lean. CU, as part of its Lean implementation programme, was keen to gather information on employee perceptions and expectations of Lean to help inform University-wide communication and training about the initiative. The interests of all the participating organisations were therefore closely aligned with those of the researcher. With such alignment, organisations were likely to be committed to the objectives of the study, to encourage employee involvement in the research and to grant the researcher longitudinal access to their employees.

Long-term organisational access is a major issue for field researchers (Matthiesen & Richter, 2007; Pettigrew, 1990) and this was an important hurdle for the researcher to overcome. Having organisations that were committed to the research and were likely to encourage employee participation was particularly important in the current study. As will become apparent later in this chapter, to meet all the research objectives, it was necessary for some employees to participate in a structured

interview/focus group and for employees to complete a fairly detailed questionnaire at Time 1 and another questionnaire targeted at 6 months later. Without organisational support, response rates were likely to be low, which may have compromised the researcher's ability to employ multivariate statistical techniques and to draw firm conclusions. Low response rates are a serious problem for researchers (Bean & Roszkowski, 1995; Rogelberg & Stanton, 2007) and response rates to employee surveys have been steadily declining over the years as companies have become increasingly flooded with questionnaires (Baruch, 1999). The competitive working climate also means that employees tend to have less time to complete questionnaires (Peiperl & Baruch, 1997). Organisational buy-in would certainly help address, if only partially, the concern about low response rates.

It is not unusual for opportunism to play some part in selecting organisations to participate in research. Opportunism was one of the factors that determined the selection of the case study sites in Radnor and Boaden's (2004) investigation into change in organisations implementing Lean. They even argue that "It is often difficult to match the purity of scientific research design with the pragmatism of gaining access and obtaining rich data from organisations – for this reason it could be argued that very little (if any) management research of this nature is anything but to a greater or lesser extent opportunistic" (p. 429). Yin (1994) also states that access is a legitimate reason for selecting organisations for research.

Given the expansion of Lean into the service sector, it was considered important to conduct the research in a service environment which CU's participation would allow. There is a steady increase in the number of universities applying Lean principles (Comm & Mathaisel, 2005a, 2005b; Emiliani, 2004a; Hines & Lethbridge, 2008). It has also been suggested that academic staff tend to have low regard for improvement tools and methods imported from industry because they believe that their use might conflict with the traditions of academia (Emiliani, 2004a; Falk, Brewer & Brewer, 1993; Roffe, 1998; Zimmerman, 1991). Understanding the factors underlying university employees' motivation for Lean is both timely and worthwhile.

Ivax and Arvin are the two manufacturing companies participating in the main body of the research. These organisations manufacture very different products (pharmaceuticals and truck brakes, respectively) and are distinctly different from each other in terms of volume and variability. Ivax manufactures high volume, low variability products whereas Arvin manufactures low volume, high variability products. Participation of these two organisations would thus allow a test of the research questions in two very different working environments and contexts.

The engineering director at the participating Arvin site was keen to implement Lean within his department and to understand what motivates his team to adopt LBs. The participation of the Arvin engineers meant that the researcher could test the research questions with a group of highly skilled individuals. The success of manufacturing firms such as Arvin is highly reliant upon the skills and behaviours of engineers because they develop new, innovative ideas for products and can help give the company that essential competitive edge. An understanding of what drives this specialised group to engage in LBs would certainly offer a valuable insight into employee motivation for Lean. The Arvin engineers, although based in a manufacturing organisation, predominantly work in a service role, designing new products. Their participation would therefore allow the researcher to explore the motivation of a specialised group of employees to adopt LBs within a service role.
Ivax, Rizla and CU were also selected based on Seppälä and Klemola's (2004) observation that there are few studies on Lean outside the automotive industry.

Table 3.1 summarises for each of the participating organisations the industry, the type of organisation (manufacturing or service), whether the whole or a subgroup of the organisation was invited to participate and the characteristics of the target sample. As shown, the Rizla, Ivax and CU samples were generally more cross-sectional than the Arvin sample.

Table 3.1: Summary Characteristics of Participating Organisations and Target Samples

Organisation	Type of organisation	Industry	Target sample	Characteristics of target samples				
				Service	Manufacturing	Shopfloor	Office	Management
Rizla	Manufacturing	Cigarette-paper	Whole organisation	✓	✓	✓	✓	✓
Ivax	Manufacturing	Pharmaceutical	Whole organisation	✓	✓	✓	✓	✓
Arvin	Manufacturing	Automotive	Engineers	✓			✓	
CU	Service	Teaching and research	Random sample from whole organisation	✓			✓	✓

3.5. Data Collection: Instruments and Procedure

According to Forza (2002), the main methods used to collect data in survey research are questionnaires (which can be administered personally, by telephone, by email or by post) and interviews (which can be structured or unstructured, face-to-face or telephone based). Figure 3.3 summarises the data collection process adopted for the current study. Structured interviews were conducted, followed by the administration of two questionnaires targeted at 6 months apart[6]. The data collection instruments and procedure received ethical approval from Cardiff Business School's Research Ethics Committee prior to data collection.

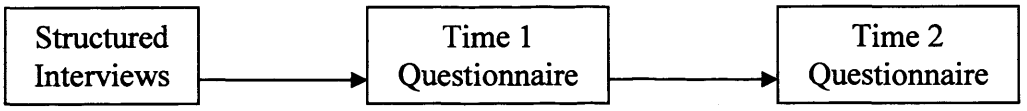

Figure 3.3: Data Collection Process

Questionnaires were the main data collection instrument. The decision to use interviews in addition to questionnaires was partly based on Bryman's (1984) observation that a superior piece of work tends to emerge if data collection techniques are combined. Douglas (1976) also argues that "since all research methods have costs and benefits and since they differ greatly in their particular costs and benefits, a researcher generally finds it best to use some combination or mixture of methods" (p. 30). Other reasons for choosing interviews in addition to questionnaires are discussed in the following section[7].

[6] Interviews were not conducted at CU for reasons discussed in Chapter 7

[7] It could be argued that that the use of interviews in addition to questionnaires positions the research closer to realism than positivism. However, as will become apparent, the interviews were very structured and the questionnaires were the main data collection instrument, which the researcher feels positions the research closer to positivism.

3.5.1. Structured Interviews

Research Question 1 concerns the identification of the beliefs employees hold regarding the outcomes of their adoption of LBs. These data can be obtained by asking a sample of respondents that is representative of the population of interest what they consider to be the advantages and disadvantages of their engagement in the behaviour(s) (Ajzen, 1991; Ajzen & Fishbein, 1980). Although this information could have been obtained via open-ended questions at the beginning of a questionnaire, the interviews would enable the researcher to summarise responses and present them back to interviewees for verification, and to use prompts such as 'what do you mean by that?' to ensure complete understanding. This was particularly important given the lack of research in this area.

The interviews served several other functions: To enable the researcher to get a feel for the culture within the organisation and how employees felt about previous change programmes that had taken place, information that could prove useful for interpreting the findings; and to capture data on the job characteristics employees particularly like and dislike to inform the job satisfaction measure in the questionnaire. Although the job satisfaction scale selected for the study is valid and reliable (see Section 3.5.2), given the diversity of the jobs of employees involved in the research, a more bespoke job satisfaction measure was deemed more appropriate. The interviews conducted with the pilot study also served to identify the salient referents for the subjective norm measure.

To ensure that the views of a cross-section of staff were heard, the researcher asked the organisations to carefully select employees from different levels, departments and functions and with different demographic profiles to take part[8]. The organisations confirmed that the participants were a good mix of the target sample and that most employees invited to participate did so. They did not feel that any particular group of individuals were less willing than others to participate. The discussions were not tape-recorded for one important reason - employee willingness to participate in this aspect of the research and for them to be open about their attitudes towards adopting

[8] Selecting participants from different departments and organisational levels was not necessary at Arvin because only non-managerial engineers were targeted.

LBs was essential and there was a general feeling among senior management in each of the participating organisations that employees would be less willing to participate or that the integrity of their responses would be compromised if the discussions were tape-recorded. The following countermeasures were taken to ensure that all relevant information was captured and that subsequent analysis would be accurate:

- A structured schedule containing pre-defined questions was used (see Table 3.2).
- Detailed notes were taken during the interviews.
- The interviews were scheduled to allow sufficient time immediately afterwards to make additional notes.
- Interviewees were presented with the interview notes and confirmed whether they were a true reflection of their responses.
- Analysis of the notes was conducted on the same day as the interview.

Table 3.2: Interview Questions

1. What do you think would be the likely *advantages* of your adopting Lean behaviours at this company in the next few months?
2. What do you think would be the likely *disadvantages* of your adopting Lean behaviours at this company in the next few months?
3. Whose opinions would you take into account when deciding whether or not to adopt Lean behaviours at this company in the next few months?[9]
4. What characteristics of your job do you particularly like?
5. What characteristics of your job do you particularly dislike?
6. What major changes have taken place since you have worked here?
7. What are your thoughts about those changes?

A 30-minute slot was allocated for each interview, which normally broke down into 20 minutes of interview time and 10 minutes for additional note-taking. Based on recommendations by Hedges (1985), the researcher started each interview by giving

[9] This question was only asked to interviewees in the pilot.

a simple explanation of what the discussion would be about (i.e., to gauge employee's feelings about adopting LBs), and informing interviewees that the interview data would be used to develop a bespoke questionnaire that would be issued to employees at the site. To encourage honest responding, all participants were assured that the interview would be completely confidential and only groups of responses would be reported. LBs were defined to participants at the beginning of the interviews as the behaviours listed in Section 2.4.

Ajzen and Fishbein's (1980) 'principle of compatibility' argument states that, when eliciting beliefs and using this data in subsequent TPB questionnaires, there should be correspondence in action, target, context and time elements. Attempts were made to meet these requirements with interview questions 1 and 2 as far as possible. However, the organisations could not confirm when they would be able to administer the Time 1 questionnaire. Therefore a time reference of 'the next few months' was used. Although this was not ideal, it was considered the most appropriate approach to adopt under the circumstances.

The participating Ivax site wanted to invite all 750 of its employees to complete the Time 1 questionnaire. In order to have discussions with a representative sample of staff in a cost- and time-efficient way, focus groups were conducted in addition to structured interviews. Focus groups offer a low-cost method of obtaining many viewpoints in a time-efficient manner (Bloor, Frankland, Thomas & Robson, 2001). The same questions listed in Table 3.2 were asked to focus group participants and Ivax confirmed that a representative sample took part in the discussions. For the reasons detailed above, the discussions were not tape-recorded. However, because focus group discussions are dynamic and complex, a second independent researcher took notes alongside the researcher to ensure full data capture. The independent researcher's role was solely to note-take; they played no part in the development/delivery of the questions or in the analysis of the responses. A 2-hour timeslot was allocated for each focus group. The discussions usually took an hour, leaving an hour for additional note-taking.

3.5.2. Questionnaires

Self-report questionnaire surveys formed the main data collection method. The Time 1 questionnaire sought to gather data on the TPB items, personality, job satisfaction, organisational commitment, past engagement in LBs, confidence to adopt LBs and demographic data (gender, age, etc). The Time 2 questionnaire, targeted at 6 months post Time 1 questionnaire, measured employee perceptions of their engagement in LBs since the Time 1 questionnaire. Examples of Time 1 and Time 2 questionnaires can be found in Appendices A and D, respectively.

A 6 month inter-questionnaire time period was chosen for several reasons:

- The participating organisations agreed that 6 months would be long enough for most of the LBs to be carried out, and would be a reasonable enough time period to ask their employees to complete a second questionnaire and for the researcher to achieve a reasonable response rate at Time 2.
- This time period would fit within the timeframe of the SUCCESS project and the time the researcher had to complete the study.
- It has been used by other researchers applying the TPB (for example, Conner, Norman & Bell, 2002; McMillan & Conner, 2003; Norman, Conner & Bell, 1999, 2000).

The Time 1 questionnaires used at Rizla, Ivax and Arvin were all paper-based. During the course of the study, the researcher was given an opportunity to undertake some training on how to use an internet application that would allow the development, launching and analysis of web-based questionnaires and the downloading of data for use in other packages (such as Excel). The tool, known as Bristol Online Survey (BOS) (see www.survey.bristol.ac.uk), was developed by the Institute for Learning and Research Technology at Bristol University. It has been deployed within many UK universities and public sector organisations and has, among its numerous applications, been used to gather information on employee perceptions of their working environment.

The CU Time 1 and Time 2 questionnaires and the Ivax and Arvin Time 2 questionnaires were administered using BOS for several valid reasons[10].

- The researcher could design the questionnaire so that questions are mandatory and respondents can only submit their responses when all mandatory questions are completed, thus eliminating missing data. Missing data is a major issue for researchers. It can seriously jeopardise the validity of results (Little & Rubin, 1987; Roth, 1994) and is particularly problematic in field research because the degree of contact with respondents is limited (Roth & Switzer, 1995).
- Data can be downloaded for use in excel and subsequently SPSS (Statistical Package for Social Sciences). Hence there is no need for data inputting, reducing the potential for error.
- BOS incorporates various response formats which meant that the researcher could design the questionnaire using the same response scales to those used in the paper-based questionnaire, therefore facilitating Time 1 and Time 2 comparisons and cross-organisation comparisons.
- Respondents can access the questionnaire via a link which can be emailed to them, which reduces administration time and costs. E-mail surveys are considerably more cost-efficient than paper-based surveys (Dillman, 2000; Sheehan & Hoy, 1999).
- For reasons discussed in Chapter 7, instead of conducting interviews/focus groups, open-ended questions were used in the CU Time 1 questionnaire to capture belief data. Respondents tend to provide more detailed responses to open-ended questions if the questionnaire is electronic rather than paper-based (Paolo, Bonaminio, Gibson, Patridge & Kallail., 2000).
- Because some of their employees work remotely, senior management at Ivax and CU felt that response rates would be higher if a web-based version of the questionnaire were made available.

The researcher does not consider that the medium in which the questionnaire was administered to limit her ability to compare the findings. Studies have demonstrated

[10] The Ivax Time 2 questionnaire was also made available in paper format because some employees did not have computer/internet access.

that paper-based and computer surveys yield the same results on attitudinal and personality measures (e.g., Cronk & West, 2002; Stanton, 1998).

To ensure participant responses to the Time 1 questionnaire could be matched to their Time 2 responses while maintaining participant anonymity, the Time 1 questionnaire requested respondents to provide a password that they would easily remember. Participants were asked to provide the same password at Time 2. The following section describes the different sections in the questionnaire and provides justifications for the selection and rejection of specific measures and scales.

3.5.2.1. Time 1 Questionnaire

Items assessing the TPB constructs were carefully designed following recommendations from Ajzen and Fishbein (1980) and the content of previous instruments used to measure these constructs (for example, Conner & Abraham, 2001; Courneya et al., 1999; Rhodes & Courneya, 2003). Efforts were made to ensure that Ajzen and Fishbein's (1980) principle of compatibility requirements were met. Consistent with attitude theory (see Eagly & Chaiken, 1998, for a review), both the general and specific components of attitude were assessed. These tend to be referred in the TPB literature as direct and indirect attitudes, respectively.

Attitude – Direct Measure. Attitude was measured using a semantic differential scale ranging from 1 to 7, the optimal measurement scale for the TPB (Courneya, Conner & Rhodes, 2006). Although research suggests that attitudes can be split into instrumental and affective components (Courneya et al., 2006; Lawton et al., 1997, 2007; Trafimow & Sheeran, 1998; Trafimow et al., 2004), only the instrumental element of attitude was measured. It was felt that affect was less likely to be relevant to employee engagement in LBs than, for example, to matters relating to health and safety where support for this affect-instrumental distinction has mainly been reported.

Respondents indicated how much they thought that their adoption of LBs at their company in the next 6 months was *extremely bad (1)* to *extremely good (7)*, *extremely sensible (1)* to *extremely foolish (7)*, *extremely valuable (1)* to *extremely worthless* (7) and *extremely wrong (1)* to *extremely right (7).* The sensible-foolish

and valuable-worthless responses were reverse scored before all four responses were averaged to form the attitude direct score. A higher score represented a more positive attitude and scores could range from 1 to 7. Items requiring reverse scoring were used to encourage respondents to deliberate each question carefully before responding and to reduce participant fatigue.

Attitude - Indirect Measure. Indirect attitudes reflect an individual's salient beliefs regarding the outcome of their engagement in the behaviour (behavioural beliefs) weighted by the evaluation of those outcomes (outcome evaluations). The indirect attitude measure used in the current study was designed based on suggestions by Ajzen (1991) and Ajzen and Fishbein (1980).

Outcomes of adopting LBs were captured during the semi-structured interviews and the focus groups by asking employees what they thought would be the likely advantages and disadvantages of their adopting LBs at their company in the next few months. For each organisation, every advantage/disadvantage that was mentioned by at least one of its employees was included in the indirect attitude measure in that particular organisation's questionnaire. Questionnaire respondents rated on a -3 (extremely unlikely) to 3 (extremely likely) scale how much they felt that their adoption of LBs at their company in the next 6 months would lead to each of the outcomes mentioned by their colleagues in the interviews/focus groups (behavioural beliefs). They evaluated each of the outcomes on a -3 (extremely bad) to 3 (extremely good) scale (outcome evaluations)[11]. Each of the behavioural belief scores was multiplied by its corresponding evaluation score. The overall indirect attitude score represented the mean across these calculated scores. A higher score reflected a more positive indirect attitude. Scores could range from -9 to 9.

Every advantage/disadvantage mentioned in the interviews/focus groups was included in the respective organisation's questionnaire. Because the interviews/focus groups only consisted of a subsample of the target questionnaire sample, an advantage/disadvantage mentioned by just one individual could be representative of a much larger number of employees.

[11] Ajzen (1991) argues that bipolar scales can be used to measure belief strength and evaluation.

Van der Pligt and Eiser (1984) suggest that when respondents are asked to rate beliefs, they should be asked to rank each belief for importance to them personally. Despite some empirical support that this can increase belief-attitude and belief-intentions correlations (Budd, 1986; Elliot, Jobber & Sharp, 1995), the researcher felt that asking respondents to do this would make an already lengthy questionnaire even more time-consuming to complete, something that could have compromised the response rates. It was therefore decided to follow the original guidelines for measuring indirect attitudes proposed by Ajzen and Fishbein (1980). Their method has received widespread empirical support (Armitage & Conner, 2001a).

Subjective Norm. Respondents indicated on a -3 (extremely unlikely) to 3 (extremely likely) scale the extent to which they believed that others would approve of their adoption of LBs at their company in the next 6 months (normative beliefs), and how much they were motivated to comply with each of these referents (motivation to comply). The others specified were "most people important to you", "your co-workers" and "your manager/supervisor". As will be discussed in Section 4.4.1, co-workers and managers/supervisors emerged as salient referents in the pilot interviews. The "most people important to you" item was included because similar items have been used in past TPB research to measure subjective norms (Armitage, Norman & Conner, 2002; Rhodes et al., 2004, 2005). Multiple items were used to measure subjective norm because single-item measures tend to be less reliable (Conner & Armitage, 1998).

Motivation to comply is the only one of Ajzen and Fishbein's (1980) scales that is traditionally scored in a unipolar rather than bipolar way. The -3 to 3 format was used in the questionnaire simply for the sake of having consistent response scales for participants and to keep the questionnaire parsimonious. This was particularly important given the length of the questionnaire. It was therefore necessary to convert the motivation to comply scores from a '-3 to 3' scale to a '1 to 7' scale. Each perception of support from a referent individual/group was multiplied by its corresponding transformed 'motivation to comply' score. Overall subjective norm reflected the mean across these three calculated scores. A higher score reflected stronger pro-Lean subjective norms. Scores could range from -21 to 21.

Perceived Behavioural Control (PBC). Participants rated on a -3 (extremely unlikely) to 3 (extremely likely) scale five items tapping their perceived confidence and ability to adopt LBs[12]. Based on Trafimow et al. (2002), Conner and Sparks (1996) and Ajzen and Fishbein (2005), items assessing *perceived difficulty* ('If I wanted to, I could easily adopt LBs at this company in the next 6 months'), *perceived control* ('I can control whether I decide to adopt LBs at this company in the next 6 months') and *self-efficacy* ('I feel confident that I can adopt LBs at this company in the next 6 months') were incorporated. Overall PBC was indexed by the mean of the responses to these five items, and composite scores could range from -3 to 3. A mean positive score reflected perceptions of control in performing LBs. A mean negative score reflected perceptions of a lack of control in performing LBs. Past TPB studies have used similar items to measure PBC (see Chorlton, 2007; Elliott et al., 2003; Rhodes et al., 2005). Control belief data (the perceived frequency of occurrence and power of factors to either facilitate or inhibit performance of LBs) was not collected because this would have lengthened the questionnaire and possibly reduced response rates.

Behavioural Intentions. Responses to "I intend to adopt LBs at this company in the next 6 months" and "I expect to adopt LBs at this company in the next 6 months" on a -3 (extremely unlikely) to 3 (extremely likely) scale were averaged to form an index of intentions.

Job Satisfaction. Warr, Cook and Wall's (1979) scale formed the basis of the job satisfaction measure. Respondents rated from extremely dissatisfied (0) to extremely satisfied (6) their level of satisfaction with various intrinsic job characteristics (job variety, opportunity to use one's abilities) and extrinsic job characteristics (rate of pay, physical working conditions). The scale also contains a global rating of job satisfaction (Considering everything, how do you feel about your job as a whole?). This scale has demonstrated good internal consistency reliability and construct and criterion validity (Griffin, Patterson & West, 2001; Tesluk, Vance & Mathieu, 1999; Warr et al., 1979). It has been used with both managers and non-managers, with

[12] The -3 to 3 response format was used simply for the sake of having consistent response scales for participants and to keep the questionnaire parsimonious. This was particularly important given the length of the questionnaire.

employees of various occupations and with manufacturing and service employees (Dolland, Winefield, Winefield & Jonge, 2000; Lok & Crawford, 2004; Parker, 2000; Patterson, Warr & West, 2004; Workman & Bommer, 2004).

This scale was preferred to the Job Descriptive Index (Smith, Kendall & Hulin, 1969) because the Job Descriptive Index is not capable of assessing the job satisfaction experienced by all employee groups (Buffum & Konick, 1982), and its response scale can lead to abnormal data distributions (Cook, Hepworth, Wall & Warr, 1981). The Minnesota Satisfaction Questionnaire (1977) was deemed too long with 100 items.

As discussed in Section 3.5.1, one of the functions of the interviews was to ensure that the job characteristics employees particularly like/dislike were captured in the job satisfaction scale. All job characteristics mentioned in the interviews/focus groups conducted at each of the organisations were added to the items in Warr et al.'s (1979) scale to measure job satisfaction in that particular organisation. As will become apparent in Chapters 4 to 6, the inclusion of these additional items did not compromise the reliability of the measure. Responses to all the job satisfaction items were averaged to form an overall satisfaction score, with a higher score indicating greater job satisfaction. Scores could range from 0 to 6.

Organisational Commitment. Mowday et al.'s (1979) scale was selected because it specifically measures the core components of organisational commitment, namely the employee's belief in, and acceptance of organisational values and goals ("I find that my values and the organisation's values are very similar"); the willingness of employees to exert considerable effort to achieve organisational goals ("I am willing to put in a great deal of effort beyond that normally expected in order to help this organisation be successful"); and their desire to maintain membership in the organisation ("I would accept almost any type of job assignment in order to keep working for this organisation").

Using a strongly disagree (0) to strongly agree (4) scale, respondents rated their agreement with 15 items. Several of the items were reverse scored before all the responses were combined and averaged to form an overall organisational commitment score, with a higher score representing greater commitment. Scores could range from 0 to 4. This measure has demonstrated high internal reliability and convergent, discriminant and predictive validity (Cook et al., 1981; Ferris & Aranya, 1983). It has been used with manufacturing and service personnel and with managers and non-managers (Gupta, Prinzinger & Messerschmidt, 1998; Haar, Spell & O'Driscoll, 2005; Huselid & Day, 1991; Martin et al., 2006; Parker, 2000).

The reverse scoring inherent in Mowday et al.'s (1979) scale was one reason the researcher selected it. Respondents had to carefully consider each question because a high response number would sometimes indicate high commitment ("I am willing to put in a great deal of effort beyond that normally expected in order to help this organisation be successful") and sometimes low commitment ("I feel very little loyalty to this organisation"). The high Cronbach alpha scores obtained for this scale (see Chapters 4 to 6) suggest that participants did carefully consider each question before responding.

Personality. To avoid low response rates and participant boredom/fatigue, short measures were favoured. The Big Five Inventory (BFI) (John, Donahue & Kentle, 1991) is a 44-item personality inventory that allows efficient and flexible assessment of the big five personality dimensions. Consisting of short phrases on the trait adjectives known to be prototypical of the 'Big Five', respondents indicate using a strongly disagree (0) to strongly agree (4) scale their agreement with various statements such as 'I see myself as someone who prefers work that is routine' (an 'openness to experience' item). Some of the items had to be reverse scored, another reason for selecting the BFI, before responses were combined appropriately and averaged to form scores for each of the five traits. Scores for each trait could range from 0 to 4.

The BFI was preferred to Costa and McCrae's (1992) 60-item Five Factor Inventory (the NEO-FFI), because the NEO-FFI uses a complex sentence format that some of

the less highly educated employees completing the questionnaire might find difficult to understand. Goldberg's (1992) Trait Descriptive Adjectives measure was rejected because it does not provide as much context as the short-phrase items used in the BFI (John & Srivastava, 1999).

The California Psychological Inventory (Gough, 1987) contains 480 items and the Minnesota Multiphasic Personality Inventory (Hathaway & McKinley, 1943) contains 550 items. Both measures were considered too long. The Eysenck Personality Questionnaire (Eysenck, Eysenck & Barrett, 1985) and the 16PF (Cattell, Eber & Tatsuoka, 1970) were rejected on the grounds that they do not measure all of the Big Five traits.

Despite the BFI scales including only eight to ten items, neither content coverage nor psychometric properties are compromised. The BFI correlates highly with the NEO-FFI and Goldberg's scale (John & Srivastava, 1999). The alpha reliabilities of the BFI scales typically range from 0.75 to 0.90, with an average above 0.80, and the 3 month test-rest reliabilities range from 0.80 to 0.90, with an average of 0.85 (John & Srivastava, 1999). The BFI has been used in numerous studies (Flynn, Chatman & Spataro, 2001; Levine & Jackson, 2002; O'Reilly & Chatman, 1994) including one exploring the interaction between the TPB and personality (Conner & Abraham, 2001). Although the publicly available internet-based International Personality Item Pool (http://ipip.ori.org/ipip) could have been used, the researcher felt that the impressive support for the BFI deemed it sufficient for the current study.

The meanings of several of the words used in the BFI (e.g., 'aloof') might be unclear to some of the less highly educated employees completing the questionnaire and could subsequently lead to missing data or inaccurate results. Roth (1994) recommends making questionnaires as easy as possible to understand to reduce missing data. Using the Thesaurus in Microsoft Office Word 2003, these words were changed to more colloquial language. As will become apparent in Chapters 4 to 6, these alterations did not lead to unreliable scales.

Lean Self-efficacy (LSE). The Role-Breadth Self-Efficacy (RBSE) scale developed by Parker (1998) formed the basis of the LSE measure. As discussed in Section 2.4,

in developing the scale, Parker (1998) interviewed a cross-section of staff from a glass manufacturing company and asked them to describe proactive, interpersonal, and integrative activities that they felt were increasingly important for them to engage in to be effective in their job. Of the 20 tasks mentioned, Parker selected the 10 she judged to be the most generalisable to other organisations and groups of employees. These 10 items, which subsequently formed the RBSE scale, are listed in Table 2.4 of Chapter 2 and include activities such as 'analysing a long-term problem to find a solution' and 'designing new procedures for your work area'. The Cronbach's alpha for this scale is reported to be as high as 0.96 (Axtell & Parker, 2003). This scale (or versions of it) has been used with staff of all levels in manufacturing firms and in public sector organisations (Axtell & Parker, 2003; Parker, 2000; Rafferty & Griffin, 2006).

Although not specifically labelled as Lean, the types of behaviour included in Parker's (1998) RBSE scale were the types employees in organisations implementing Lean are encouraged to adopt. It was nevertheless clear that several important LBs were not included in the scale. Yet "the set of tasks was not intended to be exhaustive; the aim was to represent important exemplar elements of an expanded role that apply across jobs and hierarchical levels" (Parker, 1998, p. 839).

To develop a more holistic LSE measure capable of capturing employee confidence to adopt a wider range of LBs, various illustrative texts which detailed the type of behaviours expected of employees in Lean organisations were consulted (Appelbaum & Batt, 1994; Berggren, 1993; Forza, 1996; Jackson et al., 1993; Krafcik, 1988; MacDuffie, 1995; Niepce & Molleman, 1998; Rees et al., 1996; Womack et al., 1990). This highlighted 12 additional LBs including rotating jobs and tasks with colleagues, working as part of a team, training colleagues, keeping one's work area neat, tidy and safe, using one's initiative, using a variety of skills/abilities, and taking part in decisions and improvement activities. Autonomous working is central to Lean and selected items from Jackson et al.'s Job Control Scale (1993) were used to measure autonomy (deciding how to go about getting your job done, planning your own work, deciding on the order in which you do things). Parker (1998) used items from Jackson et al.'s (1993) scale in her investigations into RBSE and found that task control/job autonomy was related to RBSE.

For the current study, two items were dropped from Parker's (1998) scale ("writing a proposal to spend money in your work area" and "contacting people outside the company such as suppliers and customers to discuss problems") because, according to senior management at the participating organisations, most of the target sample would have limited opportunity to engage in those behaviours. The Cronbach alphas reported in Chapters 4 to 7 suggest that these inclusions and exclusions did compromise the reliability of the LSE scale and, in one instance, actually increased it to 0.98. Another contribution the researcher makes to the Lean literature is the development of the LSE measure.

Participants rated how confident they would feel engaging in the 20 LBs on a "not at all confident" (0) to "very confident" (4) scale. Responses to the items were averaged to form an overall LSE score, with a higher score reflecting higher LSE. Scores could range from 0 to 4. This response method differs from the one proposed by Bandura (1986), which involves asking respondents to indicate with a 'yes' or a 'no' if they can perform the behaviour, and then asking them to report their degree of confidence in that endorsement. Bandura's (1986) approach was not appropriate for the LSE measure because, following Parker's (1998) argument, "it was not possible to obtain a set of tasks that all employees would have had an opportunity to perform. What was of interest here was people's belief in their capability to perform such a task if it were asked of them" (p. 839).

The LSE scale served an important secondary function - to define to respondents what was meant by 'adopting LBs'. This was crucial for respondents to be able to give informed responses to the questions which refereed to LBs. The LSE measure contained the preamble *'people working in Lean organisations normally adopt the following behaviours'*, and the LSE section appeared in the questionnaire before any reference was made to LBs. Researchers using questionnaires to explore the efficacy of the TPB to explain behaviour define the behaviour in the questionnaire if it is deemed necessary (see Rhodes & Courneya, 2003; Rhodes et al., 2005).

Past Behaviour[13]. As discussed in Chapter 2, LBs do not consist of just one or two behaviours, but rather a category of behaviours. Ajzen and Fishbein (1980) propose that to obtain a self-report measure of a behavioural category, it is necessary to identify the set of behaviours relevant to the category in question. The LSE scale includes a set of relevant behaviours and it therefore seemed appropriate to use the items from this scale in the past behaviour measure. According to Ajzen and Fishbein (1980), respondents should be presented with the list of behaviours and asked to report whether or not they perform each of the behaviours on a dichotomous yes/no scale. In the current study, a Likert scale with response labels 'not at all' (0), 'just a little' (1), 'a reasonable amount' (2), 'quite a lot' (3) and 'a great deal' (4) was used. These response alternatives have been used to measure perceived job characteristics and methods of working in previous studies (see Jackson et al, 1993; Mullarkey et al. 1995; Warr et al., 1979) and allow some measurement of frequency of past behaviour. Respondents reported the extent to which they currently engage in each of the 20 LBs at their organisation and responses were averaged to form a past behaviour score with scores potentially ranging from 0 to 4. Past behaviour was not measured using a statement such as "In the past I have frequently engaged in LBs" on a 'strongly disagree' to 'strongly agree' scale because it was felt that this measure would not have fully captured the extent of employee's past engagement in the full range of LBs.

Demographic Information. Respondents indicated their organisational tenure (in years), gender and age (specified in categories 16-25, 26-35, 36-45, 46-55, 56-65[14]) and whether they occupied a managerial position and whether they were a member of a Union.

Password. Respondents were asked to provide a password that they would easily remember. As will be discussed in the following section, this was used to help match up the Time 1 and Time 2 questionnaire data.

[13] The terms 'past behaviour' and 'Time 1 behaviour' will be used interchangeably.
[14] An additional age category of >65 years was included in the CU questionnaire.

3.5.2.2. Time 2 Questionnaire

The Time 2 questionnaire asked employees to report their engagement in each of the LBs at their organisation in the past 6 months[15] using the same items and response format as the past behaviour measure. Responses were averaged to form an overall Time 2 behaviour score with scores potentially ranging from 0 to 4[16].

There were valid reasons for selecting a self-report measure of behaviour. Self-report measures can provide a robust method for obtaining behavioural data (Ajzen & Fishbein, 1980); observing behavioural categories rather than single behaviours can be a complex process (Ajzen & Fishbein, 1980); obtaining objective measures of behaviour can be expensive and time-consuming (Ajzen & Fishbein, 2004); the TPB is predictive of self-report behaviours (Armitage & Conner, 2001a; Lawton et al. 2007); and self-reported behaviour is frequently used in TPB research (see Conner & Godin, 2007; Courneya et al., 2006; Norman & Conner, 2006).

Time 2 behaviour[17] was not measured by asking respondents to state whether they had engaged in LBs at their company in the past 6 months on a strongly disagree to strongly agree scale because it was felt that this measure would not fully capture the true extent of employee engagement in the full range of LBs.

The Time 2 questionnaire also asked respondents to indicate whether they had completed a questionnaire concerning LBs 6 months[18] previously and, if they had, to provide the same password that they had provided on their Time 1 questionnaire. This data was used to facilitate the matching of the Time 1 and Time 2 questionnaires. Gender, age and organisational tenure data were also collected to aid in matching up the data for respondents who did not provide a password on their Time 1 and/or Time 2 questionnaire[19].

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[15] This was 11 months for the Ivax Time 2 questionnaire for reasons to be discussed in Chapter 5.
[16] BOS does not assign numbers to response labels. Hence, for the Time 2 questionnaires completed electronically, the responses 'not at all', 'just a little', 'a reasonable amount', 'quite a lot' and 'a great deal' were given the values 0, 1, 2, 3 and 4, respectively.
[17] The terms 'Time 2 behaviour' and 'future behaviour' will be used interchangeably.
[18] This was 11 months for the Ivax questionnaire for reasons that will become apparent in Chapter 5.
[19] The researcher bore in mind the possibility that some individuals may indicate a different age category at Time 2 than at Time 1 if they were at the top end of an age category at Time 1.

3.5.3. Countermeasures to Address Potential Methodological Limitations of Study

The researcher recognised a number of potential methodological limitations of the current research and attempted to address these concerns through a series of carefully designed countermeasures.

Self-report questionnaires can give rise to common method variance, which is variance caused by the measurement method (Fiske, 1982), and can lead to measurement errors that threaten the validity of the conclusions about the relationships between measures. In their critical review of the literature on common method biases, Podsakoff, MacKenzie, Lee and Podsakoff (2003) propose that distinguishing the measures by using different response formats (semantic differential, Likert scales) can reduce bias. Prior responses become less salient and available to the respondent, thus reducing their ability and/or motivation to use prior responses to answer subsequent questions. The current study employed both the semantic differential and the Likert response format. Although the Likert format was predominantly used, many of the Likert scales employed different response labels and endpoints (i.e., extremely dissatisfied [0] to extremely satisfied [6], strongly disagree [0] to strongly agree [4], extremely unlikely [-3] to extremely likely [3]), which reduces method biases caused by commonalities in scale endpoints and anchoring effects (Podsakoff et al., 2003).

Podsakoff et al. (2003) propose protecting participant anonymity as a procedure to minimise method bias. Assuring that all data will remain anonymous reduces the likelihood of participants editing their responses to be more socially desirable and consistent with how they think the researcher wants/expects them to respond. Anonymity assurance in the questionnaire was particularly important in the current study given the sensitivity of some of the questions. Respondents were not asked to provide their names on the questionnaire and were assured that their responses would remain anonymous and that only grouped or averaged responses would be reported, thus protecting their identity. Although respondents were asked to provide a password on the questionnaire that they would easily remember in order to enable the

matching of the Time 1 and Time 2 questionnaire data, these passwords were participant generated, thereby preserving anonymity.

Researchers run the risk that the respondent sample is not sufficiently representative of the target sample. The researcher liaised extensively with the organisations and stressed to them the importance of having a representative sample participate in the interviews/focus groups. The organisations seemed to follow the researcher's recommendations and invited employees of different demographic profiles and from different organisational levels to participate. Subsequent discussions with the organisations confirmed that all the people invited to take part did so, reassuring the researcher that the collected interview/focus group data was reasonably representative.

Many of the conclusions drawn from the study would be based on the questionnaire data. It was therefore of great importance that the people who completed the questionnaire were sufficiently representative of the sample under investigation. The survey cover letter at both Ivax and CU stressed that the questionnaire was relevant to all members of the organisation, and the researcher emphasised to the contacts at all four organisations the importance of encouraging all members of the target population to participate[20]. As will become apparent in Chapters 4 to7, there appear to have been no large differences between the demographic and professional profiles of respondents and non-respondents, suggesting that the questionnaire had been designed appropriately to appeal to the target populations.

[20] As will be discussed in Chapters 4 and 6, it was not necessary to have a cover letter at Rizla and only engineers were invited to complete the Arvin questionnaires.

Chapter 4 – Rizla Pilot Study

4.1. Introduction

To test the proposed methodology and to ensure that the questions included in the interview schedule and Time 1 questionnaire could be easily understood by participants, a pilot study was conducted with a sample of employees from Rizla, a cigarette paper manufacturer based in South Wales. The Time 2 questionnaire was not piloted given its clear similarities with the Time 1 instrument. The results from the pilot will be analysed, where possible, in relation to the hypotheses and the research questions because it is intended that they will contribute to the study's findings.

4.2. Background to Rizla

Rizla was established in the early 1940s as a family-owned business and remained privately owned until its acquisition by Imperial Tobacco in the late 1990s. The participating site was a cost centre based in South Wales, UK employing 133 people and represented one of two sites owned by the parent company that makes similar products. It was perpetually benchmarked against its sister site in Belgium using the primary measures of productivity and cost. The need for Rizla to become more competitive by reducing overall costs meant that one of the two sites was likely to close and that the surviving site would absorb all production. The production process at the South Wales site spanned two production halls, one owned by the parent company and one leased. The lease was due to expire. To reduce overheads, the management team chose not to renew the lease but to consolidate all production into the owned production hall. This meant that there would be less space available for inventory, raw materials and finished goods stocks and a JIT approach characterised by product flow and customer pull would be needed. To achieve these objectives, senior management decided to introduce Lean within the site and appointed an internal Lean Champion to facilitate the process. The Plant Manager hoped that Lean would not only create space and promote flow but also encourage employees at

all organisational levels to adopt a more proactive role and to engage in some of the typical LBs such as problem-solving and making suggestions for improvement.

4.3. Data Collection

The Lean Champion helped to arrange the interviews and confirmed that a cross-section of 29 employees (22 shopfloor personnel, 2 administrative staff, 5 managers) from different departments was interviewed. The interviews took place between 30th March 2005 and 14th April 2005. In addition to answering the questions in Table 3.2, interviewees were asked at the end of the interview whether they found the interview questions straightforward and their views on the interview process.

Interviewees appeared to understand the questions and to feel comfortable responding and elaborating when requested. The time slots proved to be adequate for conducting the interviews and recording sufficient notes for analysis. The note-taking during the interview did not seem to interfere with the flow of the discussion or to distract interviewees from responding.

All 133 staff members attended a 15-minute briefing on either the 26th or 27th July 2005 in which they received the Time 1 questionnaire (see Appendix A) and an empty envelope addressed to the researcher. After explaining the purpose of the questionnaire, the researcher gave employees the opportunity to look at the questionnaire and to ask any questions either at the briefing or afterwards if they preferred. No questions were asked, suggesting that employees found the questionnaire reasonably self-explanatory. Employees were requested to complete the questionnaire outside work hours within the next 2 weeks, to seal it in the envelope provided and to return it either to their supervisor or to the Lean Champion for collection by the researcher at the end of the 2-week period.

4.4. Results

4.4.1. Interviews

The structured nature of the interview schedule and the generation of the interview notes greatly facilitated the analysis. The absence of transcribed manuscripts did not seem to compromise the researcher's ability to extract the necessary data from the interview notes.

Employees reported a number of positive beliefs about adopting LBs both for themselves (that it would help them to work smarter, make their job more interesting, increase their job satisfaction and work motivation, improve communication, boost morale, create a safer work environment); and for the organisation (that it would increase company profits and productivity, improve the quality of products, reduce the amount of work-in-progress, create a more efficient production process, create a more spacious work environment). Some negative beliefs were also reported, namely that adopting LBs would lead to job losses, closure of the site, a decline in working conditions and increased job stress. The beliefs listed here were mentioned by at least one of the interviewees. As discussed in detail in Section 3.5.2.1., each of these beliefs was incorporated into the indirect attitude measure that formed part of the Rizla questionnaire.

Supervisors/managers and colleagues emerged in the interviews as salient referents that influence an employee's decision to adopt LBs, suggesting that these referents should be included in the subjective norm measure of the questionnaire.

4.4.2. Questionnaire

4.4.2.1. Respondent Sample Characteristics and Missing Data

Forty-two questionnaires were returned, a 31.6% response rate. All respondents provided a password, suggesting that this would be a good method for matching up the Time 1 and Time 2 questionnaire data. Missing data appeared minimal, with

38.1% respondents (n = 16) providing complete data, 57.1% (n = 24) with less than 5% missing data and 4.8% (n = 2) with 16.4% and 17.5% missing data. The researcher analysed to see whether any of the questions in the questionnaire were particularly susceptible to missing data. Eighty-three questions yielded missing data. Of these, 75% (n = 63) yielded only one missing data point, 21.4% (n = 18) two, and 2.4% (n = 2) three. This suggests that the missing data were randomly distributed and that the questionnaire did not contain any items especially prone to missing data.

To test the hypotheses, means would need to be calculated for most of the measures in the questionnaire. In the presence of just one missing data point in a scale for an individual, a mean value would not be calculated for that individual's scoring on that scale. Given the relatively small sample size at Rizla, the researcher could not afford for this to happen. When calculating mean scores for individuals with missing data, the researcher summed the responses provided on the scale for the individual and then divided this value by the number of valid responses the individual had provided on the scale. By using this method, all individuals who had responded to at least one of the questions in a scale could contribute to the overall mean for that scale.

Tabachnick and Fidell (2001) recommend that any scores that are more than three standard deviations from the mean for a given variable should be classed as outliers and omitted from the analysis for that variable. Outliers bias the mean and inflate the standard deviation (Field & Hole, 2003). On this basis the researcher omitted one case (value = -3.00) from the intentions mean, one case (value = 0.07) from the organisational commitment mean, one case (value = 1.00) from the conscientiousness mean and one case (value = 4.00) from the neuroticism mean.

For valid and reliable results, it is important that the respondent sample is representative of the population under study (Baruch, 1999). Answers from respondents may differ substantially from those of non-respondents, resulting in biased results (Bean & Roszkowski, 1995). To check for this, the respondent sample was compared with the potential sample on various job-related and demographic characteristics (see Table 4.1). The respondent sample appears to be fairly representative and the questionnaire does not seem to discriminate/favour particular groups of individuals.

Table 4.1: Comparison of Respondent Sample with Potential Sample on Job-related and Demographic Characteristics

		Respondent sample[21] (n = 42)	Potential sample (n = 133)
Managers		8.8% (n = 3)	10.5% (n = 14)
Average organisational tenure		14.8 years (SD = 8.22)	16 years[22]
Union members		81% (n = 33)	75.2% (n = 100)
Female		60% (n = 24)	47% (n = 63)
Age	16-25 years	5% (n = 2)	45 years[23]
	26-35 years	12.5% (n = 5)	
	36-45 years	40% (n = 16)	
	46-55 years	37.5% (n = 15)	
	56-65 years	5% (n = 2)	

SD = standard deviation

A review of 141 papers published in five of the leading management and behavioural sciences journals *(Academy of Management Journal, Human Relations, Journal of Applied Psychology, Organizational Behaviour and Human Decision Processes,* and *Journal of International Business Studies)* in 1975, 1985 and 1995, covering over 200,000 respondents, led Baruch (1999) to conclude that a response rate of 36% +/- 13 is acceptable for top management, and a response rate of 60% +/- 20, for employees and conventional populations. Since employees would constitute the bulk of the sample in the current study, the researcher was aiming for a response rate between 40% and 80%. Baruch (1999) argues that anything below or above this "conventional" response rate should be explained. The 32% response rate can be attributed to several factors: Employees were asked to complete the questionnaire outside work hours, which would have taken each of them approximately 25 minutes; the questionnaire was fairly long, which can deter participation

[21] Percentages are based on the number of individuals who responded to the question.
[22] Rizla only provided the mean organisational tenure of employees, hence the absence of a standard deviation value.
[23] Rizla only provided the mean age of employees and not a breakdown into different age categories.

(Yammarino, Skinner & Childers, 1991); and employees had completed several other attitude surveys a few months prior to the researcher's questionnaire. Under these circumstances, a 32% response rate is considered respectable and suggests that the questionnaire is of reasonable length and content not to deter participation from a sufficient number of people.

4.4.2.2. Descriptives and Hypothesis Testing

The questionnaire data were analysed using SPSS version 12. To test the reliability of each of the measures (Cronbach, 1951), Cronbach alphas were calculated (see diagonal in Table 4.2). Each alpha is equal to or higher than 0.70, suggesting that the measures are sufficiently reliable for use in the main body of the research (Hair, Anderson, Tatham & Black., 1992; Nunnally, 1978).

The means (M) and standard deviations for the variables are shown in Table 4.2[24]. Rizla respondents generally had strong intentions to adopt LBs (M = 1.94) and positive attitudes towards their engagement in LBs (M = 5.82). On average, respondents expressed fairly weak subjective norms with respect to adopting LBs (M = 7.51). The indirect attitude results suggested that respondents generally felt that their adoption of LBs would lead to slightly positive outcomes (M = 2.08). The PBC mean (M = 1.04) indicates that respondents tended to perceive slight control with respect to adopting LBs. Respondents were slightly satisfied with their job (M = 3.79) and slightly committed to their organisation (M = 2.52). The past behaviour mean (M = 2.14) suggests that respondents were already engaging in LBs a reasonable amount at the time of completing the questionnaire. On average, respondents reported feeling quite confident adopting LBs (M = 2.69). The mean scores for the personality measures indicated that respondents were generally conscientious (M = 3.04), agreeable (M = 2.96), open to new experiences (M = 2.55), extraverted (M = 2.57) and emotionally stable (M = 1.37). Descriptive statistics

[24] As detailed in Section 3.5.2.1, intentions and PBC scores could range from -3 to 3, attitude (direct) scores from 1 to 7, attitude (indirect) scores from -9 to 9, subjective norm scores from -21 to 21, job satisfaction scores from 0 to 6 and organisational commitment, past behaviour, LSE and the five personality traits scores from 0 to 4.

relating to organisational tenure, employee level, union membership status, gender and age are reported in Table 4.1.

The researcher intended to test the hypotheses and research questions using parametric tests such as Pearson correlations, t tests and regressions. One of the assumptions of parametric tests is that the variables are sufficiently normally distributed. Applying a parametric test with non-parametric data will often lead to inaccurate and misleading results (Field, 2000). It is possible to determine normality by using the Kolmogorov-Smirnov test. Conducting Kolmogorov-Smirnov tests on each of the continuous variables listed in Table 4.2 revealed that the intentions, attitude direct, job satisfaction and organisational tenure variables were all significantly abnormally distributed. Abnormal data can be transformed using a log, square root or reciprocal transformation (Field, 2000). The intentions variable was considered first. A series of Kolmogorov-Smirnov tests suggested that the intentions variable remained significantly abnormally distributed after applying each of these transformations to the intentions scores. The raw intentions scores were therefore dichotomised using the median split method. People scoring below the median were given a value of zero (n = 9) and people scoring on or above the median, a value of one (n = 31). MacCallum, Zhang, Preacher and Rucker (2002) argue that dichotomisation of a quantitative variable is defensible when a variable is extremely abnormally distributed, and that dichotomising using the median split method is the most common and appropriate technique to employ. For consistency, dichotomisations rather than transformations were used for all the other significantly abnormally distributed variables - attitude direct (n above median = 25, n below median = 16), job satisfaction (n above median = 21, n below median = 21) and organisational tenure (n above median = 21, n below median = 19).

Table 4.2: Means (M), Standard Deviations (SD), Zero-order Correlations and Alpha Coefficients ($n = 42$)

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Intentions	1.94	1.14	**0.98**																		
2	Attitude - Direct	5.82	0.89	0.35*	**0.89**																	
3	Attitude - Indirect	2.08	2.34	0.22	0.39*	**0.84**																
4	Subjective Norm	7.51	7.02	0.42**	0.43**	0.55***	**0.84**															
5	PBC	1.04	0.92	0.49***	0.47**	0.51***	0.47**	**0.70**														
6	Job satisfaction	3.79	0.77	-0.15	-0.02	0.36*	0.15	0.21	**0.91**													
7	Organisational commitment	2.52	0.55	-0.05	0.03	0.49***	0.27	0.26	0.34*	**0.92**												
8	Past Behaviour	2.14	0.69	-0.19	0.21	0.38*	0.06	0.08	0.24	0.18	**0.89**											
9	LSE	2.69	0.95	0.14	0.50***	0.26	0.19	0.31*	-0.08	-0.01	0.66***	**0.98**										
10	Conscientiousness	3.04	0.49	0.29	0.29	0.34*	0.45**	0.27	0.00	-0.06	0.35*	0.54***	**0.73**									
11	Agreeableness	2.96	0.55	0.15	0.06	0.26	0.31	0.17	-0.04	0.24	0.13	0.15	0.31	**0.71**								
12	Openness	2.55	0.57	0.14	0.25	0.14	0.11	0.13	-0.04	-0.08	0.33*	0.65***	0.53***	0.13	**0.82**							
13	Extraversion	2.57	0.65	0.11	0.20	0.06	0.16	-0.04	-0.06	-0.07	0.37*	0.60***	0.58***	0.28	0.56***	**0.88**						
14	Neuroticism	1.37	0.64	-0.03	-0.14	-0.20	-0.08	-0.08	-0.11	0.04	-0.25	-0.38*	-0.54***	-0.54***	-0.09	-0.41**	**0.84**					
15	Organisational tenure (years)	14.80	8.22	0.09	0.07	0.04	0.20	0.34*	0.20	0.01	0.28	0.28	0.23	-0.17	-0.04	0.10	-0.08	/				
16	Employee level	0.09	0.29	-0.12	0.24	0.50**	0.14	0.03	0.29	0.43*	0.50**	0.38*	0.28	0.15	0.29	0.19	-0.27	0.29	/			
17	Union membership	0.80	0.40	0.17	-0.13	-0.29	-0.10	0.20	-0.36*	-0.24	-0.26	-0.09	-0.11	0.01	-0.21	-0.05	0.06	0.03	-0.67***	/		
18	Gender	1.60	0.50	0.31	0.20	0.11	0.41*	0.30	0.00	0.02	-0.11	0.09	0.21	0.00	-0.03	0.10	0.06	0.18	-0.20	-0.03	/	
19	Age	3.25	0.93	-0.21	0.25	0.09	0.18	0.37*	0.11	0.10	0.27	0.23	0.10	0.04	-0.01	0.01	0.04	0.40*	0.03	0.14	-0.09	/

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Employee level (non-managers = 0, managers = 1), union membership (non-union members = 0, union members = 1), gender (male = 1, female = 2), and age (16-25 years = 1, 26-35 years = 2, 36-45 years = 3, 46-55 years = 4, 56-65 years = 5) were all represented by dummy variables.

Logistic regression should be used with a dichotomous dependent variable (Field, 2000). However, as noted by Conner, Warren, Close and Sparks (1999), Cohen and Cohen (1983) argue that using multiple regression with a dichotomous dependent variable if no category contains less than 20% of cases is valid because it produces similar results to logistic regression. This criterion was satisfied here. Furthermore, several authors have used multiple regression with a dichotomous dependent variable (see, for example, Armitage et al., 2002; Gutek, Cohen & Konrad, 1990). The researcher therefore chose to use multiple regression but supplemented this analysis with logistic regression in tests of the TPB. The majority of TPB studies have used multiple regression and hence its use in the current study, if the above criterion were satisfied, would facilitate comparisons with past TPB research.

The direct measure of attitude will be used in the analyses on the grounds that it assesses attitudes to behaviour at a global, abstract level. It has been suggested that global, direct attitude measures are more powerful predictors of intentions than deliberative belief-based measures because they capture spontaneous, highly accessible appraisals more readily (Ajzen, 1991; Manstead & Parker, 1995). Unless stated otherwise in the remainder of the thesis, the term 'attitude' will refer to global, direct attitudes.

The results will now be analysed in relation to each of the 31 hypotheses summarised in Section 2.6. ***Hypotheses 4, 5*** and ***14*** can not be tested because no Time 2 behaviour data were collected.

Table 4.2 shows the Pearson correlations between the different variables. Of the TPB variables, intentions were significantly and positively correlated with attitude (r = 0.35, $p < 0.05$), subjective norm ($r = 0.42$, $p < 0.01$), and PBC ($r = 0.49$, $p < 0.001$), providing support for ***hypotheses 1, 2*** and ***3*** respectively[25]. Intentions were not significantly correlated with any of the non-TPB variables.

Examining these correlations suggests that PBC was the most powerful correlate, with employees reporting higher PBC expressing stronger intentions than those

[25] Following Field (2000), significance is assumed if $p < 0.05$. This assumption will be made throughout the thesis.

reporting lower PBC. The second most powerful correlate was subjective norm; employees who perceived stronger normative pressure to adopt LBs were more likely to report intentions to do so than those perceiving weaker pressure. Attitude was the third most powerful correlate; employees who held positive attitudes towards adopting LBs (they felt that it was good, valuable, sensible, right) tended to report stronger intentions than those expressing a less favourable attitude.

Baron and Kenny (1986) argue that a variable operates as a mediator if (1) a predictor variable *X* significantly accounts for variability in an outcome variable *Y*, (2) *X* significantly accounts for variability in the mediator *M*, (3) *M* significantly accounts for variability in *Y* when controlling for *X*, and (4) the effect of *X* on *Y* decreases substantially when *M* is entered simultaneously with *X* as a predictor of *Y*. Sobel (1982) provides an approximate significance test for the indirect effect of *X* on *Y* via *M*. This test has been widely reported to be useful for determining the presence or absence of indirect effects in simple mediation (MacKinnon & Dwyer, 1993; MacKinnon, Warsi, & Dwyer, 1995; Preacher & Hayes, 2004; Stone & Sobel, 1990). If a beta weight between *X* and *Y* is significant when *M* is not in the equation but non-significant when *M* is in the equation AND the Sobel test is significant, then this is evidence of full mediation. If the beta weights are significant both with and without *M*, but the beta weight with *M* is significantly lower according to a Sobel test than the beta weight without *M*, then this is evidence of partial mediation. Hypotheses concerned with mediation will be tested based on Baron and Kenny's (1986) conceptualisation of mediation and using the Sobel test[26].

Intentions were not significantly correlated with job satisfaction ($r = -0.15$, $p = 0.35$), organisational commitment ($r = -0.05$, $p = 0.78$), or LSE ($r = 0.14$, $p = 0.40$). One of Baron and Kenny's (1986) conditions for mediation is that the predictor and outcome variables must be significantly related. Therefore ***hypotheses 6, 7, 8*** and ***9*** are rejected.

[26] The Aroian (1944) version of the Sobel test popularised by Baron and Kenny (1986) where *z*-value = $a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2 + s_a^2*s_b^2)$ will be used because it does not unnecessarily omit the product of s_a and s_b.

Contrary to expectations, no significant positive correlation was found between past behaviour and intentions (r = -0.19, p = 0.24), attitudes (r = 0.21, p = 0.19), subjective norms (r = 0.06, p = 0.73) or PBC (r = 0.08, p = 0.61), leading to the rejection of ***hypotheses 10, 11, 12*** and ***13*** respectively. Past behaviour was significantly positively correlated with LSE (r = 0.66, $p < 0.001$), providing support for ***hypothesis 15.***

Because the attitude scores were abnormally distributed, a Mann-Whitney U test was conducted on the raw attitude scores for union members and non-union members. Union members (mean rank = 20.09) had slightly lower scores than non-union members (mean rank = 22.13), but this difference was not significant (U = 115.00, p = 0.65). ***Hypothesis 16*** is rejected.

Contrary to expectations, attitude is almost unrelated to organisational tenure (r = 0.07, p = 0.66) and is positively related to age (r = 0.25, p = 0.13), leading to the rejection of ***hypotheses 17*** and ***31*** respectively.

An independent t test confirmed that the mean past behaviour score of managers (M = 3.05) was significantly higher than that of non-managers (M = 1.91, t = 3.30, df = 32, $p < 0.01$). ***Hypothesis 18*** is supported.

A Mann-Whitney U test confirmed that the attitude scores of managers (mean rank = 25.17) were ranked higher than those of non-managers (mean rank = 16.18) although not significantly (U = 20.50, p = 0.12). ***Hypothesis 19*** is rejected.

Although attitude was correlated positively with openness (r = 0.25, p = 0.11), conscientiousness (r = 0.29, p = 0.07), extraversion, (r = 0.20, p = 0.20) and agreeableness (r = 0.06, p = 0.71), and negatively with neuroticism (r = -0.14, p = 0.41), none of these correlations were significant. ***Hypotheses 20 to 24*** are rejected.

As predicted, LSE had a significant positive correlation with openness (r = 0.65, $p < 0.001$), conscientiousness (r = 0.54, $p < 0.001$) and extraversion (r = 0.60, $p < 0.001$) and a significant negative correlation with neuroticism (r = -0.38, $p < 0.05$), providing support for ***hypotheses 25, 26, 27,*** and ***29*** respectively. Although LSE and

agreeableness were positively related, this relationship was non-significant ($r = 0.15$, $p = 0.33$). ***Hypothesis 28*** is rejected.

A Mann-Whitney U test confirmed that, although the raw attitude scores for females (mean rank = 21.20) were ranked higher than those for males (mean rank = 18.28), the difference was non-significant ($U = 156.50$, $p = 0.42$). ***Hypothesis 30*** is rejected. Table 4.3 summarises the hypotheses and results.

Table 4.3: Summary Table of Hypotheses and Results

	Hypotheses	Supported
H1	The more positive are employees' attitudes towards their adopting of LBs, the stronger will be their intentions to engage in LBs	✓
H2	The more positive are employees' subjective norms to adopt LBs, the stronger will be their intentions to engage in LBs	✓
H3	The higher are employees' PBC with respect to adopting LBs, the stronger will be their intentions to engage in LBs	✓
H6	Attitudes to adopting LBs will mediate the positive relationship between job satisfaction and intentions to adopt LBs	X
H7	Attitudes to adopting LBs will mediate the positive relationship between organisational commitment and intentions to adopt LBs	X
H8	PBC will partially mediate the positive relationship between LSE and intentions to adopt LBs	X
H9	Attitude will partially mediate the positive relationship between LSE and intentions to adopt LBs	X
H10	The more that employees have engaged in LBs in the past, the stronger will be their intentions to adopt LBs	X
H11	The more that employees have engaged in LBs in the past, the more positive will be their attitudes towards adopting LBs	X
H12	The more that employees have engaged in LBs in the past, the more positive will be their subjective norms to adopt LBs	X
H13	The more that employees have engaged in LBs in the past, the greater will be their PBC with respect to adopting LBs	X
H15	The more that employees have engaged in LBs in the past, the greater will be their LSE	✓
H16	Union members will have a more negative attitude towards their adoption of LBs than non-union members	X
H17	Organisational tenure and attitude to adopting LBs will be negatively related	X
H18	Managers will report greater past engagement in LBs than non-managers	✓
H19	Managers will report a more positive attitude towards their adoption of LBs than non-managers	X
H20	Openness and attitude towards adopting LBs will be positively related	X
H21	Conscientiousness and attitude towards adopting LBs will be positively related	X
H22	Extraversion and attitude towards adopting LBs will be positively related	X
H23	Agreeableness and attitude towards adopting LBs will be positively related	X
H24	Neuroticism and attitude towards adopting LBs will be negatively related	X
H25	LSE will be positively correlated with openness	✓
H26	LSE will be positively correlated with conscientiousness	✓
H27	LSE will be positively correlated with extraversion	✓
H28	LSE will be positively correlated with agreeableness	X
H29	LSE will be negatively correlated with neuroticism	✓
H30	Females will report a more positive attitude towards their adoption of LBs than males	X
H31	Age and attitude to adopting LBs will be negatively related	X

4.4.2.3. Predictors of Intentions

Regression is often used to test the efficacy of the TPB to predict intentions and behaviour (see Armitage & Conner, 2001a; Conner & Godin, 2007; Ouellette & Wood, 1998; Rhodes et al., 2005) and was therefore the preferred statistical technique. As discussed in Section 3.2.4, there are various rules of thumb regarding the recommended number of participants to independent variables needed to conduct multiple regressions. Although the researcher would have preferred to have adopted a more conservative ratio, Hair et al's. (1998) minimum 5:1 participants to independent variables ratio was assumed in order that regressions could be conducted with this relatively small sample size.

Intentions to adopt LBs were regressed onto attitude, subjective norm and PBC[27]. Since the correlation matrix (Table 4.2) showed that none of the non-TPB variables had significant zero-order correlations with intentions and as a general rule, the fewer predictors in a regression the better (Field, 2000), there seemed little value in adding any of the non-TPB variables into the regression model. The TPB variables explained a statistically significant 29.3% of the variance in intentions ($R^2 = 0.29$, $F_{\text{change } 3, 33} = 4.56$, $p < 0.01$). PBC had a marginally significant beta weight with intentions but attitude and subjective norm had non-significant beta weights (see Table 4.4)[28].

[27] For all regressions, the 'exclude cases pairwise' option was used to deal with missing values. This was based on recommendations by Pallant (2007) who argues that the 'exclude cases listwise' option can "severely, and unnecessarily, limit your sample size" (p. 209) and that the 'replace with mean' option can "severely distort the results" (p. 209). For all regressions, unless stated otherwise, the forced entry method rather than the stepwise method was used because the stepwise method can lead to inaccurate and misleading regression models (Field, 2000).

[28] A logistic regression revealed similar results. The TPB predictors significantly improved the constant-only model ($X^2 = 12.63$, $p < 0.01$) and PBC was a marginally significant independent predictor of intentions ($p = 0.08$).

Table 4.4: Regression Analysis of Intentions to Adopt LBs (all cases)

Predictor	R^2	F	β
Attitude	0.29	4.56	0.10
Subjective norm			0.22
PBC			0.34*

* $p = 0.06$

Based on Field's (2000) recommendations, the validity of the regression model was examined. Leverage statistics indicate the overall influence of a case on the model and Stevens (1992) recommends that cases with a leverage value greater than three times the average leverage value should be omitted. One case fell within this category ($D^2 = 14.70$) and was substantially higher than the next highest D^2 value (8.22). Dropping this outlier and re-running the regression showed that the TPB variables explained a statistically significant 32% of the variance in intentions ($R^2 = 0.32$, $F_{\text{change } 3, 32} = 5.02$, $p < 0.01$). PBC achieved a significant beta weight with intentions but attitude and subjective norm still had non-significant beta weights (see Table 4.5)[29]. This suggests that higher PBC with respect to adopting LBs is associated with stronger intentions to engage in LBs.

Table 4.5: Regression Analysis of Intentions to Adopt LBs (one outlier omitted)

Predictor	R^2	F	β
Attitude	0.32	5.02	0.16
Subjective norm			0.06
PBC			0.44*

* $p < 0.05$

The validity of this second regression model was investigated in detail following Chorlton's (2007) approach. Cook's distance is similar to leverage - it measures the overall influence of a case on the model. None of the cases had a Cook's distance

[29] A logistic regression revealed similar results. The TPB predictors significantly improved the constant-only model ($X^2 = 13.71$, $p < 0.01$) and PBC was a significant independent predictor of intentions ($p < 0.05$).

greater than 1 or a leverage value greater than three times the average leverage value, suggesting that none of the cases were exerting excessive influence over the model (Cook & Weisberg, 1982; Stevens, 1992). Mahalanobis distances, the distances of cases from the mean(s) of the predictor variable(s), were examined and all were acceptable (Barnett & Lewis, 1978). The presence of multicollinearity between independent variables was assessed. Multicollinearity can threaten the validity of a regression model because it increases the standard errors of the beta coefficients, which subsequently affects whether these coefficients are statistically significant. The Variance Inflation Factor (VIF) indicates whether a predictor has a strong linear relationship with the other predictor(s). None of the VIFs was greater than 10 and the tolerance statistics, which are related to the VIFs, were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). Residuals reflect the differences between the values of the dependent variable predicted by the model and the values of the dependent variables observed in the sample (Field, 2000). All of the cases had standardised residuals between -2 and +2 except for one case with a residual of -2.14. According to Field (2000), in an average normally distributed sample, 95% of cases should lie between -2 and +2, and 99%, between -2.5 and +2.5. Based on these estimates, the model represented a reasonable fit of the sample data. The Durbin Watson tests for correlations between errors. The value was acceptable at 1.33 (Durbin & Watson, 1951). Stein's R^2 formula shows how well the regression model cross-validates across a different sample of data from the same population (see Stevens, 1992). The calculated value of adjusted R^2 (0.256) and the observed value of R^2 (0.320) suggest that if the model were generated from the population rather than the sample, it would explain approximately 6.4% less of the variance in intentions. The cross validity of the model was therefore average. Overall, the predictive validity of the model was acceptable.

4.4.2.4. TPB Predictors as Mediators of Personality-intentions Relations

Since none of the five personality traits was significantly correlated with intentions and one of the conditions for mediation is that the predictor variable (personality) and outcome variable (intentions) are significantly related (Baron & Kenny, 1986), there were insufficient grounds to test the mediating role of the TPB predictors in the personality-intentions relations.

4.4.2.5. Personality as Moderator of TPB Predictor-intentions Relations

To explore the potential moderating role of personality on TPB predictor–intentions relations, interaction dummy variables were created between each of the personality variables and attitude, subjective norm and PBC. The variables were mean-centred prior to constructing the interaction variables to minimise problems of multicollinearity commonly found with interaction terms (Aiken & West, 1991). Based on Anguinis and Stone-Romero's (1997) concerns about the lack of power in moderated regression analyses to detect moderation effects, the interaction terms were entered using the stepwise method. The attitude-intentions relation was investigated first. A hierarchical regression was conducted with intentions as the dependent variable. Attitude was entered at step 1 using forced entry, openness was entered at step 2 using forced entry and the attitude-openness interaction dummy variable was entered at step 3 using stepwise entry[30]. No significant interaction was found, suggesting that openness does not moderate the attitude-intentions relation. This process was repeated for each of the other four personality traits[31]. No significant interactions were found. Repeating this process for the subjective norm-intentions and PBC-intentions relations revealed no significant interactions. These findings suggest that personality does not moderate the TPB predictor-intentions relations.

4.4.2.6. Personality and LSE

LSE was regressed onto conscientiousness, openness, extraversion and neuroticism. Agreeableness was not included because it was not significantly correlated with LSE. The four personality variables explained a statistically significant 55.2% of the variance in LSE ($F_{\text{change } 4, 35} = 10.77, p < 0.001$). Openness was the only trait with a significant beta weight (see Table 4.6). The higher employees scored on openness, the higher their LSE.

[30] The approach assumed was in accordance with Baron and Kenny (1986) and was the same as that adopted by Rhodes et al. (2005) in their investigation into the moderating role of personality within the TPB.

[31] The personality traits were explored individually given the relatively small sample size.

Table 4.6: Regression Analysis of LSE

Predictor	R^2	F	β
Conscientiousness	0.55	10.77	0.04
Openness			0.49**
Extraversion			0.22
Neuroticism			-0.22

** $p < 0.01$

The validity of the model was explored. None of the cases had a Cook's distance greater than 1 or a leverage value greater than three times the average leverage value, suggesting that none of the cases were exerting excessive influence over the model (Cook & Weisberg, 1982; Stevens, 1992). Mahalanobis distances were examined and all were acceptable (Barnett & Lewis, 1978). One case, representing 2.5% of the sample, had a standardised residual of -2.8. 2.5% is only slightly above the 1% for cases less than -2.5 or greater than +2.5 recommended by Field (2000). Overall, the model seems to represent a reasonable fit of the sample data. The Durbin Watson statistic (2.07) was close to 2, indicating that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance statistics were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). The calculated value of adjusted R^2 (0.500) and the observed value of R^2 (0.552) suggested that the cross validity of the model was average. To conclude, the predictive validity of the model seems adequate.

4.4.2.7. Analysis of Belief Data

The first column in Table 4.7 lists the beliefs generated in the interviews, the salient referents and the PBC items. The second column reports the percentage of the whole sample who reported in the questionnaire agreement with the belief (i.e., they responded 1, 2 or 3 to the statement). The behavioural beliefs of employees, in descending order, were that their adoption of LBs would create space (80.4%, n = 33), increase profits (78.5%, n = 33), create a more efficient production process (78.1%, n = 32), help them to work smarter (77.5%, n = 31), increase productivity

Table 4.7: Percentages Reporting Beliefs and Differences between Non-intenders and Intenders (all questionnaire respondents, $n = 42$) [32].

	% with belief	Behavioural Beliefs (BB) Non-intenders M	SD	Intenders M	SD		Outcome Evaluations (OE) Non-intenders M	SD	Intenders M	SD		BB*OE Non-intenders M	SD	Intenders M	SD		*r* between belief and direct attitude
Create space	80.4	0.83	0.75	1.56	1.91	*	0.83	0.75	2.29	0.91	**	1.00	0.89	3.68	5.42		0.28
Increase profits at Rizla	78.5	0.00	1.79	1.56	1.19	*	1.00	0.89	2.50	0.75	**	0.50	1.52	4.21	3.45	*	0.42**
Create a more efficient production process	78.1	0.33	1.63	1.62	1.35	*	1.33	1.03	2.47	0.99	**	1.33	3.88	4.15	4.05		0.50**
Help me to work smarter	77.5	0.33	1.97	1.36	1.14		0.33	1.51	2.42	0.50	***	2.33	2.94	3.25	3.30		0.21
Increase productivity at Rizla	71.4	0.17	1.60	1.32	1.41		0.67	0.82	2.35	1.18	**	0.00	1.67	3.06	4.42	**	0.37*
Improve quality of Rizla products	66.7	-0.33	1.75	1.24	1.48	*	1.17	0.98	2.53	1.11	***	0.50	1.97	3.09	4.39		0.29
Reduce the amount of work in progress	57.5	-0.17	0.75	0.97	2.01		-0.50	1.23	1.09	2.08		0.50	1.22	3.61	4.69		0.34*
Increase my work motivation	56.1	-0.50	1.23	0.82	1.51	*	0.50	0.84	2.44	0.56	***	-0.50	1.22	1.97	4.06	*	0.24
Make the working environment at Rizla safer	56.1	0.17	0.41	1.03	1.77		2.00	1.27	2.65	0.49		0.50	1.22	2.65	5.04		0.23
Improve communication at Rizla	55.0	-0.17	1.60	0.82	1.47		1.00	0.63	2.62	0.49	***	0.17	2.23	2.15	4.13		0.38*
Boost morale at Rizla	51.2	-0.83	1.94	0.67	1.56		1.17	0.98	2.47	0.75	**	-0.17	2.40	1.48	4.24		0.23
Contribute to job losses at Rizla	49.9	1.17	1.47	0.53	1.73		-0.17	1.72	-2.00	1.68	**	0.33	4.84	-1.00	4.66		-0.03
Make my job more interesting	43.9	-0.17	1.60	0.50	1.66		1.17	1.17	2.35	0.77	*	0.50	2.95	1.26	4.34		0.27
Increase my job satisfaction	43.9	0.00	1.67	0.38	1.65		1.17	1.17	2.48	0.67	**	0.67	2.94	0.88	4.46		0.28
Make my job more stressful	26.2	0.33	1.51	-0.44	1.86		-1.67	1.51	-1.82	1.93		-0.33	3.88	0.62	5.08		-0.22
Contribute to this site closing	17.1	0.33	1.63	-0.88	1.57		-1.50	2.07	-2.35	1.61		1.50	3.67	2.41	4.72		-0.18
Make working conditions at Rizla worse	10.0	0.60	1.34	-1.26	1.42	*	-1.50	1.38	-2.24	1.67		-1.20	2.68	3.41	4.21	*	-0.48**

Salient referents	% with belief	Normative Beliefs (NB) Non-intenders M	SD	Intenders M	SD		Motivation to Comply (MC) Non-intenders M	SD	Intenders M	SD		NB*MC Non-intenders M	SD	Intenders M	SD	
Most people important to me	46.1	-0.67	0.82	1.19	1.45	**	4.50	1.52	5.76	0.99	*	-2.67	3.93	7.69	9.01	**
Co-workers	50	-0.67	0.82	0.97	1.38	**	4.83	0.98	5.88	1.27	*	-3.00	3.95	6.41	7.69	**
Manager/supervisor	87.5	0.67	0.82	2.30	0.85	**	4.83	0.98	5.88	1.07	*	3.50	4.72	13.48	5.64	**

PBC items	% with belief	Non-intenders M	SD	Intenders M	SD	
Adopting LBs at this company in the next 6 months is easy for me to do	70.8	0.33	0.82	1.50	0.99	*
I feel confident that I can adopt LBs at this company in the next 6 months	80.5	0.17	1.33	1.88	0.88	**
If I wanted to, I could easily adopt LBs at this company in the next 6 months	80.4	0.17	1.33	1.91	0.87	**
There are few barriers to my adopting LBs at this company in the next 6 months	48.9	-0.50	1.23	0.88	1.34	*
I can control whether I decide to adopt LBs at this company in the next 6 months	47.5	-0.17	1.17	0.06	1.94	

[32] The layout of this table and subsequent belief tables follows Chorlton (2007); *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; M = mean, SD = standard deviation, r = correlation

(71.4%, n = 30), improve the quality of products (66.7%, n = 28), reduce the amount of work in progress (57.5%, n = 23), increase their work motivation (56.1%, n = 23), make the working environment safer (56.1%, n = 23), improve communication (55%, n = 22), boost morale (51.2%, n = 21), contribute to job losses (49.9%, n = 21), make their job more interesting (43.9%, n = 18), increase their job satisfaction (43.9%, n = 18), make their job more stressful (26.2%, n = 11), contribute to the site closing (17.1%, n = 7) and make working conditions worse (10%, n = 4).

The sample was divided into two groups, intenders (respondents who had a mean intentions score above the neutral point of zero, n = 34) and non-intenders (respondents with a mean intentions score on or below the neutral point of zero, n = 6). For theoretical reasons and to enable an accurate test of Research Question 1, the mid-point of the scale rather than the intentions median was chosen to divide the group. The means and standard deviations of intenders and non-intenders for the behavioural belief (BB), outcome evaluation (OE), BB*OE, normative belief (NB), motivation to comply (MC), NB*MC, and PBC items are reported in Table 4.7. A series of Kolmogorov-Smirnov tests confirmed that all of these variables were significantly abnormally distributed and hence parametric tests should not be used (Field, 2000). Therefore, to establish the presence of any significant differences between intenders and non-intenders, Mann Whitney U tests were conducted.

4.4.2.7.1. Behavioural Beliefs

For the multiplicative measures of behavioural belief by outcome evaluation, significant differences were found for increasing profits, increasing productivity, increasing work motivation and making working conditions worse. As noted by Conner, Kirk, Cade and Barrett (2003), the multiplicative composite beliefs can be difficult to interpret. Differences between intenders and non-intenders across the behavioural belief and outcome evaluation variables are therefore explored.

Whereas non-intenders expressed neutral beliefs that their adoption of LBs would increase profits, intenders expressed fairly strong beliefs that this would be an outcome (U = 43.50, $p < 0.05$). Unlike non-intenders, intenders generally believed that their adoption of LBs would improve the quality of products (U = 46.00, $p <$

0.05) and increase their work motivation (U = 39.00, $p < 0.05$). Although both intenders and non-intenders felt that their adoption of LBs would create a more efficient production process and create space, intenders expressed this belief to a greater extent than non-intenders (U = 50.50, $p < 0.05$; U = 48.50, $p < 0.05$, respectively). Unlike intenders, non-intenders generally felt that their adoption of LBs would make working conditions worse (U = 28.00, $p < 0.05$).

Several differences between intenders and non-intenders were detected which were relatively close to statistical significance. Compared to non-intenders, intenders generally expressed stronger beliefs that their adoption of LBs would increase productivity (U = 52.50, $p = 0.05$), make the working environment safer (U = 55.50, $p = 0.07$) and help them to work smarter (U = 59.00, $p = 0.10$). Unlike intenders, non-intenders believed that their adoption of LBs would contribute to the site closing (U = 57.00, $p = 0.08$). Non-intenders did not expect their adoption of LBs to boost morale (U = 52.00, $p = 0.06$), improve communication (U = 61.50, $p = 0.13$) or reduce the amount of work in progress (U = 61.00, $p = 0.13$) whereas intenders did. Other differences were clearly non-significant and related to beliefs that adopting LBs would make jobs more interesting (U = 73.50, $p = 0.26$), and more stressful (U = 73.50, $p = 0.27$), contribute to job losses (U = 85.00, $p = 0.51$) and increase job satisfaction (U = 88.00, $p = 0.58$).

Compared to non-intenders, intenders were significantly more likely to evaluate positively the following outcomes: Improving quality of products (U = 21.50, $p < 0.001$), improving communication (U = 6.50, $p < 0.001$), increasing work motivation (U = 10.00, $p < 0.001$), helping employees to work smarter, (U = 19.00, $p < 0.001$), increasing profits (U = 21.00, $p < 0.01$), boosting morale (U = 28.50, $p < 0.01$), creating space (U = 24.00, $p < 0.01$), increasing productivity (U = 18.00, $p < 0.01$), creating a more efficient production process (U = 37.50, $p < 0.01$), increasing job satisfaction (U = 35.00, $p < 0.01$), and making jobs more interesting (U = 42.00, $p < 0.05$). Compared to non-intenders, intenders were more likely to evaluate job losses negatively (U = 32.50, $p < 0.01$).

Some differences between intenders and non-intenders were close to statistical significance. Compared to non-intenders, intenders were generally more likely to

evaluate negatively making working conditions worse (U = 62.50, p = 0.06) and contributing to this site closing (U = 71.00, p = 0.11). Non-intenders evaluated reducing the amount of work in progress negatively whereas intenders evaluated this outcome positively (U = 53.50, p = 0.06). There were no differences related to the evaluation of the outcomes making the working environment safer (U = 75.00, p = 0.23) and increasing job stress (U = 91.50, p = 0.65).

4.4.2.7.2. Direct Attitude and Behavioural Beliefs

The correlation between the direct and indirect attitude measures was statistically significant (r = 0.39, p < 0.05). The final column in the top panel of Table 4.7 shows the correlations between the direct attitude score and each of the behavioural beliefs. These correlations were explored because changing behavioural beliefs can change attitudes and hence this information could be of practical use to organisations implementing Lean.

Employees were significantly more likely to have an overall positive attitude towards adopting LBs if they believed that doing so would, in descending order, create a more efficient production process (r = 0.50, p < 0.01), not make working conditions worse (r = -0.48, p < 0.01), increase profits (r = 0.42, p < 0.01), improve communication (r = 0.38, p < 0.05), increase productivity (r = 0.37, p < 0.05) and reduce the amount of work in progress (r = 0.34, p < 0.05). The direct attitude measure was regressed on these six behavioural beliefs and showed that, in combination, they explained a statistically significant 44.9% of the variance in attitude (R^2 = 0.45, $F_{change\ 6,\ 32}$ = 4.34, p < 0.01). However, none of the beliefs had a significant beta weight with attitude (see Table 4.8), possibly due to the small sample size. It is therefore perhaps more informative to consider the size of the behavioural belief-direct attitude correlations rather than the regression results.

Table 4.8: Regression Analysis of Beliefs onto Attitude

Predictor	R^2	F	β
Increase profits at Rizla	0.45	4.34	0.34
Increase productivity at Rizla			-0.36
Improve communication at Rizla			0.29
Create a more efficient production process			0.34
Make working conditions at Rizla worse			-0.20
Reduce the amount of work in progress			0.20

4.4.2.7.3. Normative Beliefs

Significant differences were found for all the multiplicative measures of normative beliefs by motivation to comply. Once again, it is more useful to analyse the differences across the individual variables constituting the multiplicative scores.

Both intenders and non-intenders felt that their manager/supervisor would support their adoption LBs, although this belief was significantly stronger for intenders than non-intenders ($\underline{U} = 19.50$, $p < 0.01$). Whereas non-intenders believed, on average, that most people important to them and co-workers did not think that they should engage in LBs, intenders believed that these salient referents would approve of such engagement ($\underline{U} = 30.00$, $p < 0.01$; $\underline{U} = 29.00$, $p < 0.01$, respectively).

Compared to non-intenders, intenders were significantly more likely to report feeling motivated to comply with their manager/supervisor, people important to them and their co-workers ($\underline{U} = 46.50$, $p < 0.05$; $\underline{U} = 50.50$, $p < 0.05$; $\underline{U} = 43.50$, $p < 0.05$, respectively).

4.4.2.7.4. PBC Items

Compared to non-intenders, intenders were significantly more likely to perceive ease in adopting LBs ("If I wanted to, I could easily adopt LBs at Rizla in the next 6 months", $\underline{U} = 27.00$, $p < 0.01$; "Adopting LBs at Rizla in the next 6 months is easy for me to do", $\underline{U} = 39.50$, $p < 0.05$). Although both intenders and non-intenders

reported, on average, confidence adopting LBs, intenders reported significantly more confidence than non-intenders ($\underline{U} = 28.00$, $p < 0.01$). Whilst intenders generally felt that there were few barriers to their adopting LBs, non-intenders tended to perceive barriers ($\underline{U} = 49.00$, $p < 0.05$). There was no difference between non-intenders and intenders concerning their perceived control about adopting LBs ($\underline{U} = 86.50$, $p = 0.62$).

4.5. Conclusions[33]

The Rizla pilot study served to test the proposed methodology and interview process and to ensure that the questions included in the interview schedule and Time 1 questionnaire could be easily understood by participants. Interviewees appeared to understand the questions and to feel comfortable responding and elaborating when requested. The time slots proved to be adequate for conducting the interviews and recording sufficient notes for analysis. The note-taking by the researcher during the interview did not seem to interfere with the flow of the discussion or to distract interviewees from responding. The structured nature of the interview schedule facilitated data capture tremendously. The absence of transcribed manuscripts did not seem to compromise the researcher's ability to extract the necessary data from the interview notes.

The 31.6% response rate from the questionnaire, although slightly below Baruch's (1999) recommended 40% minimum, was probably attributable to asking employees to complete the questionnaire outside work hours, to the length of the questionnaire, and to employees being asked to complete several other attitude surveys only months prior to the researcher's questionnaire. By encouraging other participating organisations to allow employees to complete the questionnaire during work time, the researcher hopes to achieve higher response rates. Each of the scales in the questionnaire yielded high Cronbach alpha values, indicating that the scales were sufficiently reliable for use in the main body of the research (Hair et al., 1992; Nunnally, 1978). The idea of omitting items from some of the measures to reduce the

[33] Discussion of the results is not provided at this stage but in Chapter 8. This approach will also be adopted in Chapters 5 to 7.

length of the questionnaire was rejected because this may have compromised the reliability of the scales. A 32% response rate is still respectable and it is concluded that the questionnaire is of reasonable length and content not to deter participation from a sufficient number of people.

The questionnaire respondent sample was fairly representative of the target sample, suggesting that the questionnaire did not inadvertently discriminate/favour particular groups of employees. Missing data did not appear to be a major issue. The questionnaire appears to have been appropriately designed and people are willing to respond to the different questions. To conclude, the proposed methodological approach and instruments seem appropriate for the main study and the researcher made no changes to the procedure or instruments.

Regarding the findings, Rizla respondents generally held favourable beliefs about adopting LBs, and intenders were more likely to hold favourable beliefs than non-intenders. The TPB predictors explained about one third of the variance in intentions, although PBC was the only significant independent predictor. None of the non-TPB variables were significantly correlated with intentions. Personality did not moderate the TPB predictor-intentions relations, and openness was the only personality trait to significantly independently predict LSE.

Chapter 5 – Ivax

5.1. Introduction

The pilot study suggested that the proposed methodological approach and instruments would be appropriate for the main study. Rizla respondents generally held favourable beliefs about adopting LBs, and intenders were more likely to hold favourable beliefs than non-intenders. The TPB predictors explained about one third of the variance in intentions, although PBC was the only significant independent predictor. None of the non-TPB variables were significantly correlated with intentions. Personality did not moderate the TPB predictor-intentions relations, and openness was the only personality trait to significantly independently predict LSE. Ivax, a pharmaceutical manufacturer based in Southern Ireland, participated in the main study.

5.2 Background to Ivax

Ivax is a holding company with subsidiaries engaged in the research, development, manufacture, and marketing of branded and brand equivalent pharmaceuticals in the U.S and international markets. The company and its subsidiaries employ approximately 5,800 people in more than 30 countries throughout the world. The participating site was established in 1990 and employed around 750 people in April 2006. The site spans two production halls, one manufacturing solid dose pharmaceuticals and the other manufacturing inhalations products.

In January 2006, Ivax was acquired by Teva, one of the top 20 pharmaceutical companies, employing some 14,500 people. Teva stressed to the Waterford Senior Management Team that the site would be challenged to re-invent itself in terms of its business model and cost profile, and would be expected to reduce costs and waste, and to ramp up production by the end of 2006. To achieve these objectives, senior management introduced Lean into the business in early 2006.

From 2003, the site had adopted a Continuous Improvement (CI) approach to the business and a team of CI experts had been recruited to design and manage the delivery of improvement projects across the site. As part of the initial cost-cutting efforts, a strategic decision was made to do away with the CI unit in mid-2006 and to encourage all employees to engage in CI efforts as part of their daily activities. A CI Director was appointed to facilitate the process and to provide training where necessary. In early 2007, 30 staff members (middle managers and shopfloor staff) took voluntary redundancy, which Ivax offered as a longer term cost-cutting exercise.

Prior to data collection, 5S (a tool used to create an organised, efficient, safe and clean work environment) had been implemented extensively on the shopfloor. Visual management systems, standard operating procedures, shadow boards and suggestion boxes were widely used in the manufacturing areas.

5.3. Data Collection

On 25th, 26th and 27th April 2006, 2 managers, 6 office workers (HR personnel, analysts, administrators) and 7 shopfloor employees were interviewed. During the same time, three focus groups were conducted, one consisting of managers (n = 7), one of office workers (n = 8) and one of shopfloor employees (n = 8).

On 18th July 2006, all 750 employees at the site were invited by the HR Director to complete the Time 1 questionnaire during work hours within the next three days. The HR Director drafted a cover letter to accompany the questionnaire (see Appendix B). The letter explained the purpose of the survey, invited all employees to participate, encouraged honest responding, assured employees that all responses would remain anonymous, and asked respondents to write a password that they would easily remember in the space provided in the questionnaire. The Time 1 questionnaire can be found in Appendix C.

Employees were given several options for completing the questionnaire. They could either visit the researcher in a designated room during the 3-day period where the researcher would explain the content of the questionnaire and be available for any questions; collect the questionnaire from the researcher, complete it and return it to

the researcher; or receive the questionnaire by email, print it out, complete it and either return it to the researcher or post it in one of several boxes distributed around the site for the researcher to collect at the end of the three days. Most office-based employees chose to print the questionnaire to complete it. The shopfloor supervisors collected a handful of the questionnaires, administered them to their shift and returned them to the researcher at the end of the three days. Fewer than ten people visited the researcher in the designated room, and this was normally just to ask about the purpose of the questionnaire and to take the questionnaire away to complete.

At the time the Time 2 questionnaire was due to be administered (January 2007), the HR Director informed the researcher that Ivax would not be able to administer it because the site had several upcoming external audits and staff would be seriously pressed for time. The site was also initiating some voluntary redundancies and felt that administrating a survey at such a sensitive time would be inappropriate. Ivax agreed to administer it in June 2007. Although the researcher ideally wanted the Time 2 data collected in January 2007 to align with the timeframe specified at Time 1 and to meet Ajzen and Fishbein's (1980) principle of compatibility requirements, this time discrepancy was beyond the researcher's control but will be borne in mind when discussing the results in Chapter 8.

The HR Director invited all employees to complete the Time 2 questionnaire on 19th June 2007 with a closing date of 28th June 2007[34]. For reasons discussed in Section 3.5.2, the Time 2 questionnaire was available electronically via the link http://www.surveys.cardiff.ac.uk/ivaxtime2/. Employees without computer/internet access were provided with a hard copy from HR (see Appendix D). Because only a handful of people visited the researcher in the designated room at Time 1 coupled with time and cost considerations, the researcher was not based at the site at Time 2. The HR department posted back completed hard copies of the questionnaire on 29th June 2007.

[34] Although the researcher was only interested in the Time 2 behaviour of Time 1 respondents, given the anonymity of the questionnaires, it was not possible to identity this group of individuals and hence the Time 2 questionnaire had to be administered to all employees at the site.

5.4. Results

5.4.1. Interviews and Focus Groups

Employees reported a number of positive beliefs about adopting LBs' both for themselves (that it would help them to work smarter and to save time, make their job more interesting, increase their job satisfaction and work motivation, improve communication, boost morale and decrease job frustration); and for the organisation (that it would increase company profits and productivity, improve processes, efficiency and quality of products, reduce costs and the amount of work-in-progress, and create a more competitive company). Several negative beliefs were also reported, namely job losses, closure of the site and greater job stress. The beliefs listed here were mentioned by at least one of the interviewees and focus group participants. As discussed in detail in Section 3.5.2.1., each of these beliefs was incorporated into the indirect attitude measure that formed part of the Ivax Time 1 questionnaire.

5.4.2. Questionnaires

5.4.2.1. Respondent Sample Characteristics and Missing Data

331 of the 750 employees at the site completed the Time 1 questionnaire, a 44.1% response rate. This is within the 40%-80% response rate recommended by Baruch (1999). 171 completed the Time 2 questionnaire. Given that 30 people had left the business between the two survey periods, reducing the potential sample at Time 2 to 720, this reflected a 23.8% response rate. This is considerably lower than the Time 1 response rate. Employees may have felt less motivated to complete the Time 2 questionnaire after the redundancies in January 2007.

Regarding missing data for the Time 1 questionnaire, 47.1% (n = 156) provided complete data and 43.8% (n = 145) had less than 5% missing data. Much of the missing data was random, with just one item omitted from a scale for one respondent. Just under 4% (n = 13) provided less than 50% complete data. Analysis of the questionnaires revealed that these individuals had only received half of the

questionnaire due to a printing error. Given the high volume of questionnaires to be administered and logistical issues of transporting the questionnaires to the site, Ivax had arranged the printing and distribution of many of the questionnaires. This printing error was unfortunate but was beyond the researcher's control under the circumstances.

118 Time 2 respondents (69%) reported that they had completed a similar questionnaire the previous year, of which 72 (61%) could be confidently matched using the participant generated passwords and demographic data. Of those 72, 40.3% (n = 29) completed the Time 2 questionnaire online and 59.7% (n = 43) completed the paper-based version. All the operators who completed the Time 2 questionnaire used the paper-based version because they did not have computer/internet access at work. The researcher therefore felt that there would be little value in comparing the characteristics of people who had completed the questionnaire online with those who had completed the paper-based version.

The online questionnaire was designed so that responses could only be submitted once all the questions had been answered. Hence there were no missing data for the 29 online submissions. For the 43 hard copy submissions, 67.4% (n = 29) provided complete data, 25.6% (n = 11) had only 2% missing data and the remaining 7% (n = 3) had less than 9% missing data. These missing data were unsystematically distributed.

Based on Tabachnick and Fidell's (2001) recommendation concerning the omission of outliers (any scores that are more than three standard deviations from the mean for a given variable), the researcher omitted 7 cases from the intentions mean (all values of -3), 4 from the attitude-indirect mean (values of -6.63, -6.16, -5.68 and -5.41), 6 from the PBC mean (all values of -3), 1 from the subjective norm mean (a value of -18), 1 from the job satisfaction mean (a value of 0.75), 1 from the LSE mean (a value of 0.45), 2 from the agreeableness mean (values of 1.44 and 1.56), 2 from the organisational tenure mean (both values of 20) and 2 from the age mean (both in the 56-65 age category).

Similar to the Rizla dataset, when calculating the mean scores for variables of interest for individuals with missing data, the researcher summed the responses provided on a particular scale for the individual and then divided this value by the number of responses the individual had provided on that scale. By using this method, all individuals who had responded to at least one of the questions in a scale could contribute to the overall mean for that scale.

To check for the representativeness of the respondent samples as suggested by Baruch (1999), the Time 1 respondent sample and the 72 people with matched Time 1 and Time 2 data were compared with their respective potential samples on various job-related and demographic characteristics (see Table 5.1). The Time 1 respondent sample appears fairly representative of the Time 1 potential sample except that more managers completed the questionnaires than would be expected. This was similarly the case at Time 2. Managers were targeted by HR to encourage their teams to complete the questionnaire. Manager participation may simply reflect this targeting. The Time 2 matched sample consisted only of people who had completed the Time 1 questionnaire and hence who had been at the organisation at Time 2 for at least 11 months. This would explain the one year difference between the average organisational tenure for the matched sample and the Time 2 potential sample. Compared to the Time 2 potential sample, it seems that females and non-union members were more likely to complete the two questionnaires. The researcher approached Ivax to try to unearth some reasons for these differences but they were not able to offer any. This is not considered a problem but simply suggests that females and non-union members were generally more likely to complete the two questionnaires.

Table 5.1: Comparison of Samples on Job-related and Demographic Characteristics

		Time 1 respondent sample (n = 331)	Time 1 potential sample (n = 750)	Time 1 and Time 2 matched sample (n = 72)	Time 2 potential sample (n = 720)
Managers		16.1% (n = 48)	8 % (n = 60)	23.9% (n = 17)	8 % (n = 58)
Average organisational tenure[35]		6.64 years (SD = 4.28)	6.7 years	7.33 years (SD = 4.06)	6.3 years
Union members		61.9% (n = 192)	64% (n = 480)	48.6% (n = 35)	63% (n = 454)
Females		49% (n = 142)	51% (n = 383)	54.2% (n = 39)	44% (n = 317)
Age[36]	16-25 years	10.8% (n = 33)	Mean = 36 years	4.2% (n = 3)	Mean = 33 years
	26-35 years	56.1% (n = 171)		66.7% (n = 48)	
	36-45 years	26.2% (n = 80)		20.8% (n = 15)	
	46-55 years	6.9% (n = 21)		6.9% (n = 5)	
	56-65 years	0% (n = 0)		1.4% (n = 1)	

SD = standard deviation

[35] Ivax only provided the mean organisational tenure of employees, hence the absence of standard deviations

[36] Ivax only provided the mean age of employees and not a breakdown into different age categories

5.4.2.2. Descriptives and Hypothesis Testing

The means (M) and standard deviations for the variables are shown in Table 5.2[37]. Respondents generally had moderate intentions to adopt LBs (M = 1.24) and positive attitudes towards their engagement in LBs (M = 5.65). On average, respondents expressed very weak subjective norms with respect to adopting LBs (M = 3.58). The indirect attitude results suggest that respondents generally felt that their adoption of LBs would lead to slightly positive outcomes (M = 2.63). The PBC mean (M = 0.91) suggests that respondents tended to perceive some control with respect to adopting LBs. Respondents were slightly satisfied with their job (M = 3.34) and very slightly committed to their organisation (M = 2.12). The past behaviour mean (M = 1.98) suggests that respondents were already engaging in LBs a reasonable amount at the time of completing the Time 1 questionnaire. On average, respondents reported feeling quite confident adopting LBs (M = 2.72). The mean scores for the personality measures indicated that respondents were generally conscientious (M = 3.05), agreeable (M = 3.00), open to new experiences (M = 2.54), extraverted (M = 2.42) and emotionally stable (M = 1.42). Descriptives relating to organisational tenure, employee level, union membership, gender and age are reported in Table 5.1.

Cronbach's alpha scores for each of the measures are shown on the diagonal in Table 5.2. All the alphas are higher than 0.70, suggesting reliable measures (Hair et al., 1992; Nunnally, 1978).

Kolmogorov-Smirnov tests suggested that all the continuous variables, except the LSE and Time 2 behaviour variables, were significantly abnormally distributed. Field (2000) argues that Kolmogorov-Smirnov tests should be interpreted with caution when dealing with large samples because small deviations from normality often lead to significant results. Researchers should use the results from the Kolmogorov-Smirnov tests and plot their data to make an informed decision about the extent of non-normality (Field, 2000). Because the Ivax sample was reasonably

[37] As detailed in Section 3.5.2, intentions and PBC scores could range from -3 to 3, attitude (direct) scores from 1 to 7, attitude (indirect) scores from -9 to 9, subjective norm scores from -21 to 21, job satisfaction scores from 0 to 6 and organisational commitment, past behaviour, Time 2 behaviour, LSE and the different personality traits scores from 0 to 4.

large (n = 331), the histograms and distribution plots for each of the continuous variables were analysed. Based on a visual analysis of the histograms and plots, all the variables appeared fairly normally distributed. Due to the inconsistency in these results, skewness and kurtosis values were also analysed. The skewness and kurtosis values for all of the continuous variables were between -1 and 1 which, according to Peat and Barton (2005), suggests normally distributed variables. Furthermore, in a study conducted by Lawton et al. (2007), skewness and kurtosis values between -1 and 1 were taken as evidence of normally distributed variables. It was concluded that all of the continuous variables were sufficiently normally distributed and that there would be no need for dichotomisations or transformations.

Table 5.2 shows the Pearson correlations between the different variables. Intentions were significantly and positively correlated with attitude (r = 0.51, p < 0.001), subjective norms (r = 0.51, p < 0.001) and PBC (r = 0.60, p < 0.001), providing support for ***hypotheses 1, 2*** and ***3*** respectively. Of the TPB predictors, PBC is the strongest correlate of intentions, followed by attitude and subjective norm in joint second.

In descending order, intentions also had a significant positive correlation with indirect attitude (r = 0.40, p < 0.001), organisational commitment (r = 0.34, p < 0.001), job satisfaction (r = 0.21, p < 0.001), LSE (r = 0.19, p < 0.001), openness (r = 0.18, p < 0.01), past behaviour (r = 0.17, p < 0.01), agreeableness (r = 0.17, p < 0.01), conscientiousness (r = 0.16, p < 0.01) and extraversion (r = 0.13, p < 0.05). Of all the variables significantly correlated with intentions, PBC was the strongest correlate.

Although intentions and Time 2 behaviour were positively related, the correlation was non-significant (r = 0.17; p = 0.16). ***Hypothesis 4*** is rejected.

Table 5.2: Means (M), Standard Deviations (SD), Zero-order Correlations and Alpha Coefficients (n = 331)

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Intentions	1.24	1.19	**0.92**																			
2	Attitude - Direct	5.65	0.90	0.51***	**0.91**																		
3	Attitude - Indirect	2.63	2.44	0.40***	0.57***	**0.94**																	
4	Subjective Norm	3.58	6.54	0.51***	0.40***	0.47***	**0.78**																
5	PBC	0.91	1.03	0.60***	0.35***	0.36***	0.39***	**0.84**															
6	Job satisfaction	3.34	0.62	0.21***	0.20***	0.18***	0.21***	0.26***	**0.91**														
7	Organisational commitment	2.12	0.56	0.34***	0.26***	0.32***	0.37***	0.29***	0.65***	**0.88**													
8	Past behaviour	1.98	0.69	0.17**	0.31***	0.24***	0.22***	0.09	0.38***	0.33***	**0.91**												
9	LSE	2.72	0.70	0.19***	0.37***	0.43***	0.18**	0.26***	0.07	0.11*	0.51***	**0.95**											
10	Conscientiousness	3.05	0.48	0.16**	0.23***	0.23***	0.11	0.11	0.08	0.21***	0.18**	0.25***	**0.80**										
11	Agreeableness	3.00	0.46	0.17**	0.20***	0.16**	0.11	0.16**	0.19***	0.33***	0.10	0.17**	0.59***	**0.79**									
12	Openness	2.54	0.49	0.18**	0.21***	0.25***	0.07	0.20***	-0.03	0.08	0.27***	0.48***	0.29***	0.22***	**0.75**								
13	Extraversion	2.42	0.51	0.13*	0.14*	0.25***	0.10	0.16**	0.07	0.07	0.17**	0.26***	0.36***	0.30***	0.34***	**0.74**							
14	Neuroticism	1.42	0.62	-0.10	-0.12*	-0.19***	-0.02	-0.20***	-0.10	-0.16**	-0.08	-0.21***	-0.47***	-0.47***	-0.21***	-0.45***	**0.81**						
15	Organisational tenure (years)	6.64	4.28	-0.03	-0.10	-0.07	-0.06	-0.11	0.04	-0.05	0.10	-0.04	-0.09	-0.02	-0.04	-0.14*	0.11	/					
16	Employee level	0.16	0.37	0.12	0.24***	0.23***	0.14*	-0.02	0.09	0.06	0.43***	0.27***	0.02	-0.07	0.07	0.00	0.00	0.20***	/				
17	Union membership	0.62	0.49	-0.06	-0.13*	-0.13*	-0.08	-0.01	-0.15**	0.01	-0.51***	-0.31***	-0.01	0.05	-0.15**	-0.08	0.03	-0.12*	-0.54***	/			
18	Gender	1.49	0.50	0.07	0.04	-0.01	0.04	0.00	0.00	-0.02	-0.08	-0.09	0.06	0.08	-0.21***	-0.05	0.13*	-0.02	-0.01	0.03	/		
19	Age	2.29	0.75	-0.04	0.01	0.00	-0.01	-0.10	0.03	0.10	0.24***	0.07	0.04	0.03	0.04	-0.07	-0.08	0.40***	0.21***	-0.27***	-0.18**	/	
20	Time 2 behaviour	2.06	0.67	0.17	-0.03	0.20	0.16	0.14	0.09	0.16	0.39***	0.29*	0.08	0.19	0.20	0.13	-0.31*	-0.04	0.48***	-0.34**	0.14	0.04	**0.92**

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Employee level (non-managers = 0, managers = 1), union membership (non-union members = 0, union members = 1), gender (male = 1, female = 2), and age (16-25 years = 1, 26-35 years = 2, 36-45 years = 3, 46-55 years = 4, 56-65 years = 5) were all represented by dummy variables.

Note: The Time 2 behaviour results are based on the matched sample of 72

Time 2 behaviour was significantly correlated with past behaviour (r = 0.39, p < 0.001), providing support for ***hypothesis 14***. In descending order, Time 2 behaviour was also significantly correlated with employee level (r = 0.48, p < 0.001) with managers reporting greater engagement in LBs than non-managers, union membership (r = -0.34, p < 0.01) with non-union members reporting greater engagement in LBs than union members, neuroticism (r = -0.31, p < 0.05) and LSE (r = 0.29, p < 0.05). Of all the variables significantly correlated with Time 2 behaviour, employee level was the strongest correlate.

Since PBC and Time 2 behaviour are not significantly related (r = 0.14, p = 0.27), ***hypothesis 5*** is rejected.

Regressions were conducted to determine whether attitude mediates the positive relation between job satisfaction and intentions (***hypothesis 6***). The beta weight for the path between job satisfaction and intentions with attitude in the equation is significant albeit lower (β = 0.12, p < 0.05) than when attitude is not in the equation (β = 0.21, p < 0.001). A Sobel test confirmed that attitude mediated the job satisfaction-intentions relationship (t = 3.30, p < 0.001), although only partially because a significant beta weight between satisfaction and intentions remains with attitude in the equation. Because attitude is a partial rather than full mediator, ***hypothesis 6*** is partially supported.

The beta weight for the path connecting organisational commitment and intentions when attitude is in the equation is significant but lower (β = 0.23, p < 0.001) than when attitude is not in the equation (β = 0.34, p < 0.001). A Sobel test confirmed that attitude mediates the organisational commitment-intentions relationship (t = 4.12, p < 0.001), although only partially because a significant beta weight between commitment and intentions remains with attitude in the equation. Because attitude is a partial rather than full mediator, ***hypothesis 7*** is partially supported.

Hypothesis 8 proposes that PBC will partially mediate the positive LSE-intentions relation. The beta weight between LSE and intentions when PBC is not in the equation is significant (β = 0.19, p = 0.001). When PBC is in the equation, the beta weight becomes non-significant (β = 0.04, p = 0.44). The Sobel test result was

significant (t = 4.22, p < 0.001). This suggests that PBC fully mediates the LSE-intentions relation.

The beta weight between LSE and intentions reduces to non-significance (β =0.00, p = 0.99) when attitude is entered into the equation. The Sobel test result was significant (t = 5.54, p < 0.001). This also suggests that attitude fully mediates the LSE-intentions relation. Logically, there cannot be two full mediators in a relationship. These findings may have occurred due to the significant correlation between attitude and PBC (r = 0.35, p < 0.001). It is concluded that the LSE-intentions relation is mediated by one underlying full mediation which constitutes components of both attitude and PBC and that ***hypotheses 8*** and ***9*** are supported.

As predicted, the greater employees past engagement in LBs, the stronger their intentions (r = 0.17, p < 0.01), the more positive their attitudes (r = 0.31, p < 0.001), the more positive their subjective norms (r = 0.22, p < 0.001), the greater their PBC (r = 0.09, p = 0.12) and the greater their LSE (r = 0.51, p < 0.001). Apart from the 'past behaviour–PBC' relation, all these correlations were significant. ***Hypotheses 10, 11, 12*** and ***15*** are supported and ***hypothesis 13*** is rejected.

Union members (M = 5.56) had significantly (t = 2.37, df = 279.87, p < 0.05) more negative attitudes than non-union members (M = 5.80), providing support for ***hypothesis 16***.

Organisational tenure and attitude were negatively related but not significantly (r = -0.10, p = 0.10). ***Hypothesis 17*** is rejected.

Managers (M = 2.64) reported significantly greater past engagement in LBs (t = -9.83, df = 82.05, p < 0.001) than non-managers (M = 1.84), and managers (M = 6.15) reported significantly more positive attitudes (t = -4.97, df = 80.67, p < 0.001) than non-managers (M = 5.57) ***Hypotheses 18*** and ***19*** are supported.

As predicted, attitude was significantly positively related to openness (r = 0.21, p < 0.001), conscientiousness (r = 0.23, p < 0.001), extraversion (r = 0.14, p < 0.05) and

agreeableness (r = 0.20, p < 0.001), and significantly negatively related to neuroticism (r = -0.12, p < 0.05). ***Hypotheses 20 to 24*** are supported.

LSE was significantly positively correlated with openness (r = 0.48, p < 0.001), conscientiousness (r = 0.25, p < 0.001), extraversion (r = 0.26, p < 0.001) and agreeableness (r = 0.17, p < 0.01), and significantly negatively correlated with neuroticism (r = -0.21, p < 0.001). ***Hypotheses 25* to *29*** are supported.

Females (M = 5.71) reported only a slightly more positive attitude than males (M = 5.64). This difference was non-significant (t = -0.67, df = 281, p = 0.50). ***Hypothesis 30*** is rejected.

There was no relationship between age and attitude (r = 0.01, p = 0.93). ***Hypothesis 31*** is rejected.

Table 5.3 summarises the hypotheses and results.

Table 5.3: Summary Table of Hypotheses and Results

	Hypotheses	Supported
H1	The more positive are employees' attitudes towards their adopting of LBs, the stronger will be their intentions to engage in LBs	✓
H2	The more positive are employees' subjective norms to adopt LBs, the stronger will be their intentions to engage in LBs	✓
H3	The higher are employees' PBC with respect to adopting LBs, the stronger will be their intentions to engage in LBs	✓
H4	Intentions and future employee engagement in LBs will be positively related	X
H5	PBC will have a direct relationship with future engagement in LBs independent of intentions	X
H6	Attitudes to adopting LBs will mediate the positive relationship between job satisfaction and intentions to adopt LBs	✓ partial mediator
H7	Attitudes to adopting LBs will mediate the positive relationship between organisational commitment and intentions to adopt LBs	✓ partial mediator
H8	PBC will partially mediate the positive relationship between LSE and intentions to adopt LBs	✓
H9	Attitude will partially mediate the positive relationship between LSE and intentions to adopt LBs	✓
H10	The more that employees have engaged in LBs in the past, the stronger will be their intentions to adopt LBs	✓
H11	The more that employees have engaged in LBs in the past, the more positive will be their attitudes towards adopting LBs	✓
H12	The more that employees have engaged in LBs in the past, the more positive will be their subjective norms to adopt LBs	✓
H13	The more that employees have engaged in LBs in the past, the greater will be their PBC with respect to adopting LBs	X
H14	The more that employees have engaged in LBs in the past, the greater will be their future engagement in LBs	✓
H15	The more that employees have engaged in LBs in the past, the greater will be their LSE	✓
H16	Union members will have a more negative attitude towards their adoption of LBs than non-union members	✓
H17	Organisational tenure and attitude to adopting LBs will be negatively related	X
H18	Managers will report greater past engagement in LBs than non-managers	✓
H19	Managers will report a more positive attitude towards their adoption of LBs than non-managers	✓
H20	Openness and attitude towards adopting LBs will be positively related	✓
H21	Conscientiousness and attitude towards adopting LBs will be positively related	✓
H22	Extraversion and attitude towards adopting LBs will be positively related	✓
H23	Agreeableness and attitude towards adopting LBs will be positively related	✓
H24	Neuroticism and attitude towards adopting LBs will be negatively related	✓
H25	LSE will be positively correlated with openness	✓
H26	LSE will be positively correlated with conscientiousness	✓
H27	LSE will be positively correlated with extraversion	✓
H28	LSE will be positively correlated with agreeableness	✓
H29	LSE will be negatively correlated with neuroticism	✓
H30	Females will report a more positive attitude towards their adoption of LBs than males	X
H31	Age and attitude to adopting LBs will be negatively related	X

5.4.2.3. Predictors of Intentions

Hierarchical regression is commonly used to test the ability of TPB and non-TPB variables to explain variance in intentions and behaviour (see Courneya et al., 1999; Norman & Conner, 2006; Rhodes et al., 2005). In hierarchical regression, known predictors from past research are normally entered first and new predictors are entered in a separate step/block (Field, 2000). The TPB was originally claimed to be a complete theory of the proximal determinants of intentions and behaviour and the influence of other variables on intentions and behaviour is theorised to be indirect, in that the TPB variables mediate their effects (Ajzen, 1991). Therefore, to determine the predictors of intentions, attitude, subjective norm and PBC were entered in the first block of hierarchical regressions and the non-TPB predictors in the second block. Because the fewer predictors in a regression, the better (Field, 2000), only variables with significant zero-order correlations with intentions were included in the regression[38].

Attitude, subjective norm and PBC were entered at step 1 and explained a statistically significant 50.4% of the variance in intentions ($F_{\text{change } 3, 277} = 93.87$, $p < 0.001$). In descending order, intentions were significantly predicted by PBC ($\beta = 0.41$, $p < 0.001$), attitude ($\beta = 0.27$, $p < 0.001$) and subjective norms ($\beta = 0.24$, $p < 0.001$), suggesting that the higher were employee's PBC with respect to adopting LBs, the more positive were their attitudes or the more positive were their subjective norms, the stronger their intentions to engage in LBs. Non-TPB variables significantly correlated with intentions (job satisfaction, organisational commitment, past behaviour, LSE, conscientiousness, agreeableness, openness, extraversion) were entered at step 2 and explained a non-significant 1.6% of the variance in intentions ($F_{\text{change } 8, 269} = 1.09$, $p = 0.37$). PBC, attitude and subjective norm all remained significant at this step. LSE had a significant but negative beta weight at this step. This is likely to be a statistical artefact because LSE and intentions have a significant positive zero-order correlation ($r = 0.19$, $p < 0.001$). No other non-TPB variables

[38] Unless stated otherwise, this will be the case with all regressions.

were significant at step 2 (see Table 5.4). PBC was the strongest predictor of intentions[39].

Table 5.4: Regression Analysis of Intentions to Adopt LBs

Step	Predictor	R^2	ΔR^2	F	β Step 1	β Step 2
1	Attitude	0.50	0.50	93.87	0.27***	0.28***
	Subjective norm				0.24***	0.22***
	PBC				0.41***	0.42***
2	Job satisfaction	0.52	0.02	26.46		-0.07
	Organisational commitment					0.12
	Past behaviour					0.03
	LSE					-0.11*
	Conscientiousness					0.01
	Agreeableness					0.00
	Openness					0.05
	Extraversion					0.01

* $p < 0.05$, *** $p < 0.001$

Following Field's (2000) recommendations, the validity of the model was analysed. None of the cases had a Cook's distance greater than 1 or a leverage value greater than three times the average leverage value, suggesting that none of the cases were exerting excessive influence over the model (Cook & Weisberg, 1982; Stevens, 1992). Mahalanobis distances were examined and all were acceptable (Barnett &

[39] Some authors enter the non-TPB predictors before the TPB predictors (see Norman & Conner, 2006). The regression was repeated adopting this approach. The non-TPB predictors explained a statistically significant 15.2% of the variance in intentions at step 1 (F change 8, 272 = 6.10, $p < 0.001$). Organisational commitment was the only significant predictor at this step ($\beta = 0.32$, $p < 0.001$). The TPB predictors were entered at step 2 and explained a statistically significant 36.8% of the variance in intentions (F change 3, 269 = 68.64, $p < 0.001$). Organisational commitment was no longer significant at this step ($\beta = 0.12$, $p = 0.06$). PBC ($\beta = 0.42$, $p < 0.001$), attitude ($\beta = 0.28$, $p < 0.001$) and subjective norm ($\beta = 0.22$, $p < 0.001$) were the only variables with significant beta weights. The beta weights for the variables at step 2 were the same irrespective of the order in which the variables were entered.

Lewis, 1978). The vast majority (97.2%) of cases had standardised residuals between -2 and +2 and 99.2% had standardised residuals between -2.5 and +2.5. These percentages meet Field's (2000) recommendations and suggest that the model represents a reasonable fit to the sample data. The Durbin Watson statistic (1.94) was acceptable, suggesting that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance statistics were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). The calculated value of adjusted R^2 (0.500) and the observed value of R^2 (0.520) suggests that the cross validity of the model is very good. To conclude, the predictive validity of the model seems acceptable.

5.4.2.4. TPB Predictors as Mediators of Personality-intentions Relations

Regressions were conducted to determine whether attitude, subjective norms and PBC mediated the personality-intentions relations.

Regressing intentions onto the five personality traits revealed that openness was the only trait to have a significant independent effect on intentions ($\beta = 0.13$, $p < 0.05$) (see Table 5.5). Employees scoring higher on openness tended to report stronger intentions to adopt LBs. None of the other four personality traits was a significant predictor of intentions and were therefore excluded from further analyses.

Table 5.5: Regression Analysis of Personality Predictors of Intentions

Predictor	R^2	F	β
Conscientiousness	0.05	3.26	0.05
Agreeableness			0.11
Openness			0.13*
Extraversion			0.05
Neuroticism			0.03

* $p < 0.05$

Subjective norm was regressed onto openness and the beta weight was non-significant ($\beta = 0.07, p = 0.21$). Because one of Baron and Kenny's (1986) conditions for mediation is that the predictor variable (openness) must significantly account for variability in the mediator (subjective norm), subjective norm cannot mediate the openness-intentions relation.

Attitude was regressed onto openness and the beta weight was significant ($\beta = 0.21$, $p < 0.001$). The beta weight for the regression of intentions onto openness (without attitude) is significant ($\beta = 0.18, p < 0.01$). When attitude is included in the equation, the beta weight reduces to non-significance ($\beta = 0.08, p = 0.14$). The Sobel test was significant ($t = 3.46, p < 0.001$). This suggests that attitude mediates the openness-intentions relation.

PBC was regressed onto openness and the beta weight was significant ($\beta = 0.20, p = 0.001$). When PBC was added to the openness-intentions regression equation, the beta weight between openness and intentions became non-significant ($\beta = 0.06, p = 0.19$). The Sobel test was significant ($t = 3.30, p < 0.001$). This suggests that PBC mediates the openness-intentions relation. The finding that both attitude and PBC fully mediate the openness-intentions relation is possibly due to the moderately high attitude-PBC correlation ($r = 0.35, p < 0.001$). It seems that the openness-intentions relation is mediated by one underlying construct consisting of both attitude and PBC; employees scoring high on openness have more positive attitudes towards their adoption of LBs and higher PBC with respect to adopting LBs which, in turn, leads to stronger intentions to engage in LBs.

5.4.2.5. Personality as Moderator of TPB Predictor-intentions Relations

To explore the potential moderating role of personality on TPB predictor–intentions relations, interaction dummy variables were created between each of the personality variables and attitude, subjective norm and PBC. The variables were mean-centred prior to constructing the interaction variables to minimise problems of multicollinearity commonly found with interaction terms (Aiken & West, 1991). Based on Anguinis and Stone-Romero's (1997) concerns about the lack of power to detect moderation effects in moderated regression analyses, the interaction terms

were entered using the stepwise method. The attitude-intentions relation was investigated first. A hierarchical regression was conducted with intentions as the dependent variable. Attitude was entered at step 1 using forced entry, the five personality traits were entered at step 2 using forced entry and the attitude-personality interaction dummy variables were entered at step 3 using stepwise entry[40]. No significant interactions were found, suggesting that personality does not moderate the attitude-intentions relation.

Repeating the process for the subjective norm-intentions relation indicated that openness was the only significant moderator (β = -0.12, $p < 0.05$). The nature of this interaction was investigated using Aiken and West's (1991) suggested procedure of slope analysis. Regression results were compared across three levels of openness – low (mean – 1 standard deviation), moderate (mean) and high (mean + 1 standard deviation). Intentions were regressed onto subjective norm separately for the three groups. Subjective norm was a stronger predictor of intentions under low ($\beta = 0.57, p < 0.001$) than moderate ($\beta = 0.53, p < 0.001$) or high ($\beta = 0.33, p < 0.05$) levels of openness yet was a significant predictor of intentions at all three levels of openness.

The potential moderating role of personality on the PBC–intentions relation was explored using the same procedure described above. The results suggested that neuroticism was the only significant moderator (β = -0.13, p = 0.01). PBC was a stronger predictor of intentions under low ($\beta = 0.77, p < 0.001$) than moderate (β = 0.55, $p < 0.001$) or high (β = 0.52, $p < 0.001$) levels of neuroticism yet was a significant predictor of intentions at all three levels of neuroticism.

5.4.2.6. Predictors of Time 2 Behaviour

A hierarchical regression was conducted with Time 2 behaviour as the dependent variable. For exploratory purposes, all TPB variables (intentions, PBC, attitude and subjective norm) were entered followed by the non-TPB variables significantly correlated with Time 2 behaviour (past behaviour, LSE, neuroticism, employee level and union membership).

[40] The approach was in accordance with Baron and Kenny (1986) and was the same as that adopted by Rhodes et al. (2005) in their investigation into the moderating role of personality within the TPB.

Intentions and PBC were entered at step 1 and together explained a non-significant 3.3% of the variance in Time 2 behaviour ($F_{change\ 2, 58} = 0.98, p = 0.38$). Intentions and PBC explained independently 3% and 1.9% of the variance in Time 2 behaviour, respectively[41]. Neither variable had a significant beta weight at this step. Subjective norm and attitude were added at step 2 and explained a non-significant 2.8% of the variance in Time 2 behaviour ($F_{change\ 2, 56} = 0.83, p = 0.44$). No variables had significant beta weights at this step. Past behaviour, LSE, neuroticism, employee level and union membership were entered at step 3 and explained a significant 31.4% of the variance in Time 2 behaviour ($F_{change\ 5, 51} = 5.11, p = 0.001$). In descending order, employee level ($\beta = 0.35, p < 0.05$) and neuroticism ($\beta = -0.27, p < 0.05$) were significant independent predictors of Time 2 behaviour and explained respectively 20.8% ($F_{change\ 1, 55} = 15.68, p < 0.001$) and 6.3% ($F_{change\ 1, 54} = 5.09, p < 0.05$) of the variance in Time 2 behaviour. The findings suggest that managers and employees scoring lower on neuroticism were significantly more likely to engage in LBs at Time 2 than non-managers and employees scoring higher on neuroticism (see Table 5.6)[42]. The influence of employee level and neuroticism on Time 2 behaviour was independent of the TPB variables.

The validity of the model was analysed. None of the cases had a Cook's distance greater than 1 or a leverage value greater than three times the average leverage value, suggesting that none of the cases were exerting excessive influence over the model (Cook & Weisberg, 1982; Stevens, 1992). Mahalanobis distances were examined and all were acceptable (Barnett & Lewis, 1978). Nearly all (97.2%) cases had standardised residuals between -2 and +2 and 99.2% had standardised residuals between -2.5 and +2.5. These percentages meet Field's (2000) recommendations and

[41] 'Independently' in this context means entering each predictor on its own, without controlling for the other one.

[42] To acknowledge the approach adopted by authors such as Norman and Conner (2006), a hierarchical regression was conducted with the non-TPB variables entered before the TPB variables. Past behaviour, LSE, neuroticism, employee level and union membership were entered at step 1 and explained a statistically significant 33.8% of the variance in Time 2 behaviour ($F_{change\ 5, 55} = 5.61, p < 0.001$). Employee level ($\beta = 0.32, p < 0.05$) and neuroticism ($\beta = -0.29, p < 0.05$) were significant predictors of behaviour. Subjective norm and attitude were entered at step 2 and explained a non-significant 3.3% of the variance in Time 2 behaviour ($F_{change\ 2, 53} = 1.38, p = 0.26$). Employee level ($\beta = 0.36, p < 0.05$) and neuroticism ($\beta = -0.28, p < 0.05$) remained significant at this step. Intentions and PBC were entered at step 3 and explained a non-significant 0.4% of the variance in behaviour ($F_{change\ 2, 51} = 0.15, p = 0.86$). Employee level ($\beta = 0.35, p < 0.05$) and neuroticism ($\beta = -0.27, p < 0.05$) remained significant at this step. The beta weights for the variables at the final step were the same irrespective of the order in which the variables were entered.

suggest that the model represents a reasonable fit to the sample data. The Durbin Watson statistic (2.02) was close to 2, suggesting that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance statistics were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). The calculated value of adjusted R^2 (0.264) and the observed value of R^2 (0.374) suggests that if the model were generated from the population rather than the sample, it would explain approximately 11% less of the variance in behaviour. The cross validity of the model is therefore quite poor.

Table 5.6: Regression Analysis of Predictors of Time 2 Behaviour

Step	Predictor	R^2	ΔR^2	F	β Step 1	β Step 2	β Step 3
1	Intentions	0.03	0.03	0.98	0.14	0.17	0.08
	PBC				0.06	0.05	0.00
2	Attitude	0.06	0.03	0.90		-0.17	-0.23
	Subjective norm					0.12	0.03
3	Past behaviour	0.37	0.31	3.39			0.18
	LSE						0.10
	Neuroticism						-0.27*
	Employee level						0.35*
	Union membership						0.01

* $p < 0.05$

The accuracy of a regression model decreases as the number of independent variables entered increases (Field, 2000). The sample size here was moderately small for the number of independent variables. The regression was repeated entering LSE, past behaviour and union membership individually at step 3 (i.e., in three separate regressions). LSE was entered at step 3 and explained a statistically significant 9.2% of the variance in Time 2 behaviour ($F_{\text{change } 1, 55} = 5.96$, $p < 0.05$) and was the only

variable with a significant beta weight at this final step ($\beta = 0.33$, $p < 0.05$). This suggests that the higher an employee's LSE, the more likely they are to engage in LBs at Time 2 and that LSE has a direct effect on Time 2 behaviour independent of the TPB variables.

Conner and Armitage (1998) suggest that more research is needed that examines whether past behaviour has a direct independent effect on behaviour after taking account of the TPB variables. The regression was repeated with only past behaviour entered at step 3. Past behaviour explained a significant 12.2% of the variance in Time 2 behaviour at step 3 ($F_{\text{change } 1, 55} = 8.23$, $p < 0.01$) and was the only variable with a significant beta weight at this final step ($\beta = 0.37$, $p < 0.01$). This suggests that the more employees had engaged in LBs in the past, the more likely they were to engage in LBs at Time 2, and that past behaviour has a direct effect on Time 2 behaviour independent of the TPB variables.

Entering only union membership at step 3 confirmed that it explained a significant 10.1% of the variance in Time 2 behaviour ($F_{\text{change } 1, 55} = 6.59$, $p < 0.05$) and was the only variable with a significant beta weight at this final step ($\beta = -0.33$, $p < 0.05$). This suggests that union members were less likely to engage in LBs at Time 2 than non-union members, and that union membership has a direct effect on Time 2 behaviour independent of the TPB variables.

5.4.2.7. Personality as Moderator of Intentions-behaviour Relation

The same procedure described in Section 5.4.2.5 was followed to explore the potential moderating role of personality on the intentions-behaviour relation. No significant interactions were found, suggesting that personality does not moderate the intentions-behaviour relation.

5.4.2.8. Personality and LSE

A regression was conducted to determine which of the personality traits were significant independent predictors of LSE. LSE was regressed onto conscientiousness, agreeableness, openness, extraversion and neuroticism. The

personality variables explained a statistically significant 25.1% of the variance in LSE ($F_{\text{change } 5, 284} = 19.07, p < 0.001$). Openness was the only trait with a significant beta weight with LSE (see Table 5.7). The higher employees scored on openness, the higher their LSE.

Table 5.7: Regression Analysis of LSE

Predictor	R^2	F	β
Conscientiousness	0.25	19.07	0.10
Agreeableness			-0.03
Openness			0.42***
Extraversion			0.07
Neuroticism			-0.06

*** $p < 0.001$

The validity of the model was analysed. None of the cases had a Cook's distance greater than 1. Although one case had a leverage value slightly greater than three times the average leverage value suggesting that it exerted excessive influence over the model (Stevens, 1992), re-running the regression with this case dropped did not change the beta coefficients or the R^2 value so it was considered acceptable to keep this case in the model. Mahalanobis distances were examined and all were acceptable (Barnett & Lewis, 1978). 96.8% of cases had standardised residuals between -2 and +2 and almost all (99.3%) had standardised residuals between -2.5 and +2.5. These percentages meet Field's (2000) recommendations and suggest that the model represents a reasonable fit to the sample data. The Durbin Watson statistic (1.70) was close to 2, suggesting that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance statistics were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). The calculated value of adjusted R^2 (0.238) and the observed value of R^2 (0.251) suggest that if the model were generated from the population rather than

the sample, it would explain approximately 1.3% less of the variance in LSE. The cross-validity and predictive validity of the model are therefore very good.

5.4.2.9. Analysis of Belief Data

The first column in Table 5.8 lists the beliefs generated in the interviews/focus groups, the salient referents and the PBC items. The second column reports the percentage of the Time 1 questionnaire sample who reported agreement with the beliefs (i.e., they responded 1, 2 or 3 to the belief statement). The behavioural beliefs of employees, in descending order, were that their adoption of LBs would help them to work smarter (77.5%, n = 252), improve company efficiency (74.8%, n = 243), make the company more competitive (73.9%, n = 241), increase company productivity (72.0%, n = 236), improve company processes (71.8%, n = 234), help to reduce costs within the company (71.6%, n = 234), increase company profits (69.6%, n = 227), help them to save time (69.1%, n = 226), reduce the amount of work in progress (64.2%, n = 208), improve the quality of products (63.6%, n = 208), increase their job satisfaction (63.4%, n = 206), increase their work motivation (61.6%, n = 199), improve communication at the company (59.5%, n = 194), make their job less frustrating (59.3%, n = 194), make their job more interesting (58.7%, n = 192), boost morale at the company (58.2%, n = 191), make their job more stressful (28.9%, n = 93), contribute to job losses at their company (28.8%, n = 93) and contribute to the site closing (8.4%, n = 27).

The sample was divided into two groups, intenders (employees who had a mean intentions score above the neutral point of zero, n = 239) and non-intenders (employees with a mean intentions score on or below the neutral point of zero, n = 81).

The means and standard deviations of intenders and non-intenders for the behavioural belief (BB), outcome evaluation (OE), BB*OE, normative belief (NB), motivation to comply (MC), NB*MC, and PBC data are reported in Table 5.8.

Table 5.8: Percentages Reporting Beliefs and Differences between Non-intenders and Intenders (all Time 1 respondents, $n = 331$)

	% with belief	Behavioural Beliefs (BB) Non-intenders		Intenders			Outcome Evaluations (OE) Non-intenders		Intenders			BB*OE Non-intenders		Intenders			*r* between belief and attitude
		M	SD	M	SD		M	SD	M	SD		M	SD	M	SD		
Help me to work smarter	77.5	**0.43**	1.55	**1.58**	1.01	***	**1.40**	1.42	**2.22**	0.95	***	1.25	3.43	3.86	2.97	***	0.52***
Improve efficiency at this company	74.8	**0.51**	1.58	**1.55**	1.17	***	**1.60**	1.47	**2.33**	0.96	***	1.49	3.64	3.96	3.25	***	0.46***
Make this company more competitive	73.9	**0.53**	1.68	**1.53**	1.20	***	**1.73**	1.30	**2.45**	0.90	***	1.41	3.86	4.05	3.46	***	0.47***
Increase productivity at this company	72.0	**0.53**	1.57	**1.41**	1.35	***	**1.60**	1.39	**2.42**	0.96	***	1.36	3.45	3.63	3.77	***	0.32***
Improve processes at this company	71.8	0.39	1.54	1.44	1.30	***	**1.60**	1.47	**2.46**	0.86	***	1.22	3.54	3.80	3.75	***	0.50***
Help to reduce costs within this company	71.6	0.54	1.71	1.49	1.26	***	**1.75**	1.31	**2.41**	0.95	***	1.51	3.79	3.96	3.59	***	0.51***
Increase profits at this company	69.6	0.49	1.54	1.19	1.49	***	**1.83**	1.27	**2.42**	0.85	***	1.34	3.49	3.11	3.88	***	0.43***
Help me to save time	69.1	0.35	1.49	1.38	1.17	***	**1.63**	1.26	**2.18**	0.98	***	1.03	3.45	3.37	3.20	***	0.48***
Reduce the amount of work in progress	64.2	0.28	1.67	1.06	1.61	***	**1.31**	1.54	**1.82**	1.52	**	0.92	3.59	3.14	3.77	***	0.36***
Improve quality of products	63.6	0.40	1.61	1.15	1.41	***	**1.69**	1.43	**2.48**	0.96	***	1.27	3.83	3.15	3.89	***	0.35***
Increase my job satisfaction	63.4	0.08	1.76	1.22	1.32	***	**1.53**	1.57	**2.31**	1.13	***	0.86	3.85	3.16	3.48	***	0.48***
Increase my work motivation	61.6	0.17	1.53	1.11	1.29	***	**1.34**	1.63	**2.13**	1.20	***	0.59	3.54	2.74	3.33	***	0.46***
Improve communication at this company	59.5	0.18	1.61	0.98	1.48	***	**1.58**	1.68	**2.43**	1.03	***	0.96	3.85	2.65	4.04	**	0.40***
Make my job less frustrating	59.3	0.13	1.69	1.06	1.34	***	**1.66**	1.46	**2.16**	1.25	**	0.84	3.94	2.89	3.58	***	0.45***
Make my job more interesting	58.7	0.11	1.71	1.07	1.38	***	**1.39**	1.57	**2.24**	1.16	***	1.01	3.66	2.83	3.59	***	0.40***
Boost morale at this company	58.2	0.10	1.59	0.79	1.53	**	**1.54**	1.73	**2.29**	1.20	***	0.56	3.76	2.15	3.96	**	0.47***
Make my job more stressful	28.9	-0.20	1.66	-0.34	1.61		-1.07	1.83	-1.29	1.88		-0.08	3.58	0.87	3.87		-0.19**
Contribute to job losses at this company	28.8	-0.27	1.69	-0.51	1.84		**-1.40**	1.64	**-1.83**	1.54	*	0.80	3.28	1.08	4.64		0.03
Contribute to this site closing	8.4	**-1.43**	1.58	**-1.86**	1.48	*	**-1.77**	1.58	**-2.31**	1.44	**	2.94	4.42	4.60	4.77	**	-0.14*

Salient referents	% with belief	Normative Beliefs (NB) Non-intenders		Intenders			Motivation to Comply (MC) Non-intenders		Intenders			NB*MC Non-intenders		Intenders		
		M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Most people important to me	34.3	-0.44	1.38	0.41	1.46	***	4.69	1.31	5.38	1.29	***	-1.78	6.87	2.96	8.08	***
Co-workers	34.0	-0.35	1.28	0.41	1.30	***	**4.80**	1.20	**5.44**	1.23	***	-1.44	6.16	2.84	7.43	***
Manager/supervisor	65.6	0.52	1.43	1.48	1.28	***	**4.74**	1.36	**5.85**	1.00	***	2.50	7.26	8.99	8.00	***

PBC Items	% with belief	Non-intenders M	Non-intenders SD	Intenders M	Intenders SD	
Adopting LBs at this company in the next 6 months is easy for me to do	65.6	0.14	1.43	1.34	1.09	***
I feel confident that I can adopt LBs at this company in the next 6 months	78.2	**0.41**	1.45	**1.65**	0.91	***
If I wanted to, I could easily adopt LBs at this company in the next 6 months	71.3	**0.39**	1.38	**1.53**	1.08	***
There are few barriers to my adopting LBs at this company the next 6 months	57.8	0.12	1.46	0.94	1.44	***
I can control whether I decide to adopt LBs at this company the next 6 months	43.3	-0.55	1.37	0.48	1.71	***

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; M = mean, SD = standard deviation, r = correlation. Means in bold represent abnormally distributed data and where Mann Whitney U tests were used to detect significant differences.

A series of Kolmogorov-Smirnov tests suggested that all of the variables listed in Table 5.8 were significantly abnormally distributed. Based on Field's (2000) recommendations concerning the use of Kolmogorov-Smirnov tests with large samples, histograms, distribution plots and skewness and kurtosis values were also analysed. These analyses suggested that all the variables were reasonably normally distributed except for the variables with means in bold, all of which had skewness and/or kurtosis values less than -1 or greater than 1. To determine any significant differences between intenders and non-intenders, independent t tests were conducted on the normally distributed variables and Mann Whitney U tests were conducted on the abnormally distributed variables. The results are reported in Table 5.8.

5.4.2.9.1. Behavioural Beliefs

For the multiplicative measures of behavioural belief by outcome evaluation, significant differences were found for all measures except "making my job more stressful" and "contributing to job losses at this company". To interpret these results, differences between intenders and non-intenders on the behavioural belief and outcome evaluation variables are explored.

Compared to non-intenders, intenders were significantly more likely to believe that their adoption of LBs would help them to work smarter ($U = 5166.50$, $p < 0.001$), improve company efficiency ($U = 5681.50$, $p < 0.001$), make the company more competitive ($U = 6108.50$, $p < 0.001$), increase company productivity ($U = 6390.50$, $p < 0.001$), improve company processes ($t = -5.44$, $df = 117.04$, $p < 0.001$), help to reduce company costs ($t = -4.57$, $df = 110.93$, $p < 0.001$), increase company profits ($t = -3.64$, $df = 316$, $p < 0.001$), help them to save time ($t = -6.35$, $df = 317$, $p < 0.001$), reduce the amount of work in progress ($t = -3.72$, $df = 314$, $p < 0.001$), improve the quality of products ($t = -4.01$, $df = 317$, $p < 0.001$), increase their work motivation ($t = -5.37$, $df = 313$, $p < 0.001$), improve company communication ($t = -4.13$, $df = 316$, $p < 0.001$), make their job less frustrating ($t = -4.52$, $df = 114.44$, $p < 0.001$), make their job more interesting ($t = -5.02$, $df = 317$, $p < 0.001$) and boost company morale ($t = -3.51$, $df = 318$, $p < 0.01$). Although both intenders and non-intenders reported overall that that their adopting LBs would not contribute to the site closing, intenders endorsed this belief more strongly ($U = 7641.50$, $p < 0.05$). Non-intenders expressed

fairly neutral beliefs about whether increases in job satisfaction would be an outcome, whereas intenders reported beliefs that this would be an outcome (t = -5.34, df = 110.36, $p < 0.001$). Both intenders and non-intenders reported, on average, that they did not expect their adoption of LBs to make their job more stressful (t = 0.65, df = 313, p = 0.52) or to contribute to job losses (t = 1.10, df = 114.64, p = 0.27). The differences between intenders and non-intenders for these outcomes were non-significant.

Compared to non-intenders, intenders were significantly more likely to evaluate the following outcomes positively: Helping them to work smarter, ($\underline{U}$ = 6256.00, $p <$ 0.001), improving company efficiency ($\underline{U}$ = 6986.50, $p < 0.001$), making the company more competitive ($\underline{U}$ = 6486.00, $p < 0.001$), increasing company productivity ($\underline{U}$ = 6140.00, $p < 0.001$), improving company processes ($\underline{U}$ = 6209.00, $p < 0.001$), helping to reduce company costs ($\underline{U}$ = 6614.00, $p < 0.001$), increasing company profits ($\underline{U}$ = 7156.00, $p < 0.001$), helping them to save time ($\underline{U}$ = 7126.00, $p < 0.001$), reducing the amount of work in progress ($\underline{U}$ = 7401.00, $p < 0.01$), improving the quality of products ($\underline{U}$ = 6273.50, $p < 0.001$), increasing their job satisfaction ($\underline{U}$ = 6498.50, $p < 0.001$), increasing their work motivation ($\underline{U}$ = 6816.50, $p < 0.001$), improving company communication ($\underline{U}$ = 6539.00, $p < 0.001$), making their job less frustrating ($\underline{U}$ = 7384.00, $p < 0.01$), making their job more interesting ($\underline{U}$ = 6223.00, $p < 0.001$) and boosting company morale ($\underline{U}$ = 7260.50, $p < 0.001$). Compared to non-intenders, intenders were significantly more likely to evaluate negatively the outcomes "contributing to job losses at this company" ($\underline{U}$ = 7646.50, $p < 0.05$) and "contributing to this site closing" ($\underline{U}$ = 7430.50, $p < 0.01$). There was no difference between intenders and non-intenders regarding their evaluation of the outcome "making my job more stressful" (t = 0.91, df = 318, p = 0.36).

5.4.2.9.2. Direct Attitude and Behavioural Beliefs

As shown in Table 5.2, the correlation between the direct and indirect attitude measures was statistically significant (r = 0.57, $p < 0.001$). The final column in the top panel of Table 5.8 shows the correlations between each of the behavioural beliefs and the direct attitude measure.

Employees were significantly more likely to have a positive attitude towards adopting LBs if they believed that doing so would lead to each of the positively evaluated outcomes, and if they believed that doing so would not make their job more stressful or contribute to the site closing.

Direct attitude was regressed on all 19 behavioural beliefs. In combination, the beliefs explained a statistically significant 40.8% of the variance in attitude ($F_{\text{change } 19, 278} = 10.09, p < 0.001$). Employees were significantly more likely to have a positive attitude towards adopting LBs if they believed that it would improve company processes, help to reduce company costs, increase their job satisfaction and not make their job more stressful (see Table 5.9). "Increase productivity at this company" had a significant negative beta weight with attitude despite the correlation between these two variables being significantly positive. This is likely to be a statistical artefact and hence this regression result should probably be ignored.

Table 5.9: Regression Analysis of Beliefs onto Attitude.

Predictor	R^2	F	β
Help me to work smarter	0.41	10.09	0.16
Improve efficiency at this company			0.05
Make this company more competitive			-0.13
Increase productivity at this company			-0.17*
Improve processes at this company			0.23**
Help to reduce costs within this company			0.28**
Increase profits at this company			0.11
Help me to save time			0.04
Reduce the amount of work in progress			-0.03
Improve quality of products			-0.04
Increase my job satisfaction			0.21*
Increase my work motivation			0.06
Improve communication at this company			-0.05
Make my job less frustrating			0.04
Make my job more interesting			-0.15
Boost morale at this company			0.07
Make my job more stressful			-0.13*
Contribute to job losses at this company			0.03
Contribute to this site closing			0.02

* $p < 0.05$, ** $p < 0.01$

5.4.2.9.3. Normative Beliefs

Significant differences were found for all the multiplicative measures of normative beliefs by motivation to comply. To extract greater meaning, the differences across the individual variables constituting the multiplicative scores are analysed.

Whereas non-intenders generally believed that most people important to them and co-workers did not think that they should adopt LBs, intenders believed that these

salient referents would approve of such behaviour (t = -4.56, df = 314, $p < 0.001$; t = -4.57, df = 316, $p < 0.001$, respectively). Both intenders and non-intenders felt that their manager/supervisor would approve of their adoption LBs, although this belief was significantly stronger for intenders than non-intenders (t = -5.67, df = 317, $p < 0.001$).

Compared to non-intenders, intenders were significantly more likely to report feeling motivated to comply with most people important to them (t = -4.16, df = 316, $p < 0.001$), co-workers ($\underline{U}$ = 6472.50, $p < 0.001$) and their manager/supervisor ($\underline{U}$ = 4778.50, $p < 0.001$).

5.4.2.9.4. PBC Items

Compared to non-intenders, intenders were significantly more likely to report beliefs reflecting the perceived ease of adopting LBs ("Adopting LBs at this company in the next 6 months is easy for me to do", t = -7.95, df = 317, $p < 0.001$; "If I wanted to, I could easily adopt LBs at this company in the next 6 months", $\underline{U}$ = 4920.00, $p < 0.001$). Although both intenders and non-intenders reported feeling confident about adopting LBs and that there were few barriers to adopting LBs, these beliefs were significantly stronger for intenders than non-intenders ($\underline{U}$ = 4507.50, $p < 0.001$; t = -4.37, df = 313, $p < 0.001$, respectively). Non-intenders generally felt that they could not control whether they decided to adopt LBs whereas intenders reported a small degree of control. This difference was significant (t = -5.44, df = 168.91, $p < 0.001$).

5.5. Summary of Results

Ivax respondents generally held positive beliefs about adopting LBs, and intenders were more likely to hold positive beliefs than non-intenders. Attitude, subjective norm and PBC were each significant independent predictors of intentions and together explained about a half of the variance in intentions. The non-TPB variables did not predict intentions independently of the TPB variables. Although intentions and PBC were positively correlated with Time 2 behaviour, these correlations were non-significant. Past behaviour, LSE, neuroticism, employee level and union membership all had significant effects on Time 2 behaviour independently of the

TPB variables. The openness-intentions relation was mediated by attitude and PBC, openness moderated the subjective norm-intentions relation, and neuroticism moderated the PBC-intentions relation. Openness was the only personality trait with a significant independent effect on LSE.

Chapter 6 –Arvin Meritor

6.1. Introduction

Rizla and Ivax respondents generally held favourable beliefs about adopting LBs, and intenders were more likely to hold favourable beliefs than non-intenders. Attitude, subjective norm and PBC explained 32% and 50.4% of the variance in intentions among Rizla and Ivax respondents, respectively. All three TPB predictors were significant independent predictors of intentions among Ivax respondents but only PBC was significant among Rizla respondents. The non-TPB variables did not predict intentions independently of the TPB variables with either sample. Past behaviour, LSE, neuroticism, employee level and union membership all had significant effects on the Time 2 behaviour of Ivax respondents independently of the TPB variables. The Ivax results showed that the openness-intentions relation was mediated by attitude and PBC, openness moderated the subjective norm-intentions relation, and neuroticism moderated the PBC-intentions relation. Openness was the only trait to significantly independently predict LSE with both samples. The third participating organisation was Arvin Meritor (abbreviated as Arvin from hereon), a truck brake manufacturer.

6.2. Background to Arvin

Arvin, a merger between Arvin Industries and Meritor Automotive, is a tier one automotive supplier with a 100-year history of delivering technologically advanced systems and components to the motor vehicle industry. With 31,000 employees, headquarters in Michigan, U.S, and more than 120 facilities in 28 countries, Arvin has a diverse product, customer and geographic mix for light vehicle, commercial truck and trailer equipment. As the 16th largest automotive supplier in the world, Arvin's vision is to be the leading global provider in its field through a continuous commitment to improving its products, processes and practices.

At the time of data collection, the participating site based in South Wales, UK, had been implementing Lean on the shopfloor for about 5 years. Despite this, there was,

according to the engineering director Jackson, little evidence that the engineers were engaging in LBs, particularly teamworking and job rotation. Concerns about this, coupled with expectations that greater engagement in LBs would foster greater innovation and enhanced performance among the engineers, Jackson was keen to actively encourage his team to adopt a Leaner approach to their work. He wanted to gauge the level of motivation among his team to adopt LBs and to establish the key factors underlying his engineers' receptiveness to Lean. He therefore welcomed the opportunity for his team to participate in the research.

6.3 Data Collection

On 15th March 2006, interviews were conducted with a cross-section of 10 engineers.

In early September 2006, Jackson provided each engineer with a paper copy of the Time 1 questionnaire (see Appendix E). He invited them to complete it during work time in the next couple of weeks, to seal it in an envelope and to return it to him. All the questionnaires were posted back to the researcher in late September 2006.

In March 2007, Jackson invited all the engineers to complete the Time 2 questionnaire. Because all the engineers had internet access and for the reasons discussed in Section 3.5.2, this questionnaire was administered electronically (see http://www.surveys.cardiff.ac.uk/arvintime2/ and Appendix D for questionnaire content). Jackson had informal discussions with his team prior to emailing the second questionnaire, informing them of the survey's purpose, confidentiality and importance. During the few days after emailing the questionnaire link, Jackson had several further discussions with his team encouraging them to participate.

6.4. Results

6.4.1. Interviews

The engineers reported a number of positive beliefs about adopting LBs both for themselves (that doing so would increase their job satisfaction and work motivation, improve their work performance, help them to work more efficiently, and give them

more time to develop new ideas); and for the organisation (that doing so would increase company profits and productivity, help Arvin save time and money, and improve processes and the quality of products). Negative beliefs were also reported, namely job losses, closure of the site, jobs not being completed on time, an increase in errors, a decline in customer satisfaction, increased workload and greater job stress. The beliefs listed here were mentioned by at least one of the interviewees. As discussed in detail in Section 3.5.2.1., each of these beliefs was incorporated into the indirect attitude measure that formed part of the Arvin Time 1 questionnaire.

6.4.2. Questionnaires

6.4.2.1. Respondent Sample Characteristics and Missing Data

All 27 engineers in the engineering department completed the Time 1 questionnaire, a 100% response rate. Discussions with Jackson suggested that he had truly bought into the objectives of the research and had stressed to his team on numerous occasions the importance of completing the questionnaire. The 100% response rate can most likely be attributed to this support.

Missing data for the Time 1 questionnaire was minimal. 48.1% (n = 13) respondents providing complete data and 51.9% (n = 14) had less than 4% missing data. Most of the missing data was randomly distributed, with just one item being omitted from a scale for one respondent.

As with the Rizla and Ivax datasets, when calculating the mean scores for variables of interest for individuals with missing data, the researcher summed the responses provided on a particular scale for the individual and then divided this value by the number of responses the individual had provided on that scale. Hence, all individuals who had responded to at least one of the questions in a scale could contribute to the overall mean for that scale.

One engineer was recruited during the six-month inter-questionnaire period, increasing the potential sample size at Time 2 to 28. 25 engineers completed the

Time 2 questionnaire (89.3% response rate). Again, this high response rate probably reflects Jackson's support for the research and the encouragement he gave his team to participate. The Time 2 response rate is lower than that achieved at Time 1 perhaps because the second questionnaire was designed so that participants had to respond to all questions before submitting their responses. Although overcoming the problem of missing data, this may have caused some respondents not to submit any responses because they chose to omit some questions.

19 Time 1 and Time 2 questionnaires could be confidently matched using the participant generated passwords and demographic data.

Based on Tabachnick and Fidell's (2001) recommendation concerning the omission of outliers (any scores that are more than three standard deviations from the mean for a given variable), one case was omitted from the intentions mean (value = -3) and one from the agreeableness mean (value = 1.44).

The Time 1 and Time 2 matched sample was compared to the Time 2 potential sample with respect to organisational tenure, union membership status and age (see Table 6.1). The matched sample appears fairly representative of the Time 2 potential sample on these characteristics. Table 6.1 also details the profile of the Time 1 respondent sample which, given that a 100% response rate was achieved, also reflects the characteristics of the Time 1 potential sample. Compared to the matched sample, slightly more union members responded at Time 1, although this difference was not considered great enough to cause any concern regarding the representativeness of the samples.

Table 6.1: Comparison of Samples on Organisational Tenure, Union Membership Status and Age[43]

		Time 1 respondent and potential sample (n = 27)	Time 1 and Time 2 matched sample (n = 19)	Time 2 potential sample (n = 28)
Average organisational tenure		20.59 years (SD = 9.45)	19.58 years (SD = 10.18)	17 years
Union members		42.3% (n = 11)	31.6% (n = 6)	25% (n = 7)
Age	16-25 years	4% (n = 1)	5.3% (n = 1)	40.8 years
	26-35 years	16% (n = 4)	10.5% (n = 2)	
	36-45 years	56% (n = 14)	57.9% (n = 11)	
	46-55 years	24% (n = 6)	26.3% (n = 5)	
	56-65 years	0% (n = 0)	0% (n = 0)	

SD = standard deviation

6.4.2.2. Descriptives and Hypothesis Testing

The Cronbach's alpha values for the different variables are shown on the diagonal in Table 6.2. Most of the alpha scores were above 0.70, suggesting reliable scales (Hair et al., 1992; Nunnally, 1978). An exception was the conscientiousness scale, with an alpha of 0.68. Hair et al. (1998) argue that an alpha of 0.60 is acceptable when there are a small number of items in a scale. Since the conscientiousness scale consisted of only nine items, 0.68 was considered acceptable.

As mentioned in Section 3.5.2.1, the perception of support from a referent individual/group was multiplied by its corresponding 'motivation to comply' score, and the overall subjective norm score reflected the mean across these three calculated scores. The alpha for the subjective norm scale when based on the three

[43] Gender and employee level were not included because all the engineers were male and non-managers; Arvin only provided the mean organisational tenure of the engineers, hence the absence of a standard deviation for this variable; Arvin only provided the mean age of the engineers and not a breakdown into different age categories.

multiplicative subjective norm scores was 0.40, which is substantially lower than the recommended 0.70 (Hair et al., 1992; Nunnally, 1978) or 0.60 alpha value (Hair et al., 1998). A reliability analysis was conducted to determine whether one of the computed referent scores was compromising the overall subjective norm alpha. Deleting the 'most people important to me' multiplicative item reduced the alpha value to 0.11 as did deleting the 'co-worker' item, but deleting the 'manager/supervisor' item increased the alpha to 0.62. This alpha is substantially higher than the original 0.40 alpha and meets Hair et al's (1998) recommendation of 0.60 for scales with few items. The 'manager/supervisor' multiplicative item was therefore dropped from the overall subjective norm variable for this sample.

The means (M) and standard deviations for the variables are shown in Table 6.2[44]. Arvin respondents generally intended to adopt LBs (M = 1.08) and had positive attitudes towards adopting LBs (M = 5.53). The indirect attitude results suggest that respondents generally felt that adopting LBs would lead to slightly positive outcomes (M = 1.39). The subjective norm mean (M = 0.63) suggests that, on average, respondents were fairly neutral with respect to their perceptions of whether significant others would support their adoption of LBs. The PBC mean (M = 0.69) suggests that respondents tended to perceive slight control with respect to adopting LBs. Respondents were quite satisfied with their job (M = 3.71) and were fairly neutral with respect to their commitment to Arvin (M = 2.06). The past behaviour mean (M = 2.06) suggests that respondents were already engaged in LBs a reasonable amount at the time of completing the Time 1 questionnaire. The Time 2 behaviour mean (M = 1.99) suggests that respondents were engaging in LBs a similar amount at Time 2 as they had reported to be at Time 1. On average, respondents reported feeling quite confident adopting LBs (M = 2.85). The mean scores for the personality measures indicated that respondents were generally conscientious (M = 3.00), agreeable (M = 2.92), open to new experiences (M = 2.60), slightly extraverted (M = 2.28) and fairly emotionally stable (M = 1.58). Table 6.1 provides

[44]As detailed in Section 3.5.2, intentions and PBC scores could range from -3 to 3, attitude (direct) scores from 1 to 7, attitude (indirect) scores from -9 to 9, subjective norm scores from -21 to 21, job satisfaction scores from 0 to 6 and organisational commitment, past behaviour, Time 2 behaviour, LSE and the different personality traits scores from 0 to 4.

descriptive statistics relating to organisational tenure, union membership status and age.

Kolmogorov-Smirnov tests confirmed that, of all the continuous variables listed in Table 6.2, the intentions, subjective norm and agreeableness variables were significantly abnormally distributed. To be consistent with the approach adopted with the Rizla dataset, these variables were dichotomised using the median split method rather than transformed. This resulted in the following numbers in each group: High intentions = 16, low intentions = 10; high subjective norm = 22, low subjective norm = 5; high agreeableness = 19, low agreeableness = 7.

The results will now be analysed in relation to each of the 31 hypotheses summarised in Section 2.6. All the respondents were non-managers and male. Hence ***hypotheses 18, 19*** and ***30*** could not be tested with this sample.

Table 6.2 shows the Pearson correlations between the different variables. Although intentions have a fairly strong positive relationship with attitude ($r = 0.32$, $p = 0.11$) and subjective norm ($r = 0.22$, $p = 0.29$), these correlations are not significant. ***Hypotheses 1*** and ***2*** are rejected. Intentions are significantly positively correlated with PBC ($r = 0.60$, $p < 0.01$), providing support for ***hypothesis 3***. The indirect attitude measure is the only other variable significantly correlated with intentions ($r = 0.41$, $p < 0.05$). PBC is the strongest correlate of intentions, followed by indirect attitude.

Time 2 behaviour has a very weak negative relationship with intentions ($r = -0.09$, $p = 0.73$), no relationship with PBC ($r = 0.03$, $p = 0.91$), and a positive but non-significant relationship with past behaviour ($r = 0.39$, $p = 0.10$). ***Hypotheses 4***, ***5*** and ***14*** are rejected. Time 2 behaviour does not significantly correlate with any of the variables measured in the study.

Baron and Kenny (1986) argue that one of the conditions for mediation is that the predictor variable must be significantly related to the outcome variable. Since intentions are not significantly correlated with job satisfaction ($r = -0.06$, $p = 0.78$),

Table 6.2: Means (M), Standard Deviations (SD), Zero-order Correlations and Alpha Coefficients ($n = 27$)

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Intentions	1.08	0.81	**0.84**																	
2	Attitude - Direct	5.53	1.13	0.32	**0.93**																
3	Attitude - Indirect	1.39	2.19	0.41*	0.62**	**0.86**															
4	Subjective Norm	0.63	4.84	0.22	0.27	0.32	**0.62**														
5	PBC	0.69	1.03	0.60**	0.44*	0.51**	0.40*	**0.83**													
6	Job satisfaction	3.71	0.81	-0.06	0.20	0.21	0.26	0.15	**0.94**												
7	Organisational commitment	2.06	0.49	0.05	0.30	0.25	0.21	0.12	0.59**	**0.84**											
8	Past Behaviour	2.06	0.62	-0.27	0.02	-0.05	0.10	-0.05	0.54**	0.58**	**0.90**										
9	LSE	2.85	0.57	-0.11	0.21	-0.03	-0.15	-0.03	0.21	0.22	0.42*	**0.91**									
10	Conscientiousness	3.00	0.39	-0.01	0.25	0.00	-0.13	-0.04	0.02	0.35	0.25	0.40*	**0.68**								
11	Agreeableness	2.92	0.34	-0.15	-0.03	-0.26	-0.30	-0.24	0.00	0.11	-0.17	0.15	0.20	**0.75**							
12	Openness	2.60	0.43	-0.12	0.19	-0.01	-0.09	-0.14	0.19	0.36	0.42*	0.61**	0.36	-0.21	**0.77**						
13	Extraversion	2.28	0.49	0.19	0.46*	0.25	0.03	0.09	0.14	0.42*	0.36	0.19	0.65***	0.19	0.23	**0.74**					
14	Neuroticism	1.58	0.65	0.09	-0.20	0.08	0.49*	0.10	-0.14	-0.20	0.08	-0.31	-0.58**	-0.39	-0.22	-0.37	**0.85**				
15	Organisational tenure (years)	20.59	9.45	-0.10	-0.10	-0.11	-0.11	-0.06	-0.35	-0.23	0.16	0.02	0.18	0.01	-0.18	0.24	0.24	/			
16	Union membership	0.42	0.50	0.07	0.27	0.14	-0.18	-0.14	-0.25	0.10	-0.09	-0.08	0.21	0.52**	-0.36	0.47*	-0.24	0.28	/		
17	Age	3.00	0.76	-0.23	-0.13	-0.25	-0.13	-0.01	-0.24	-0.16	0.23	0.10	0.26	0.00	0.03	0.10	0.07	0.84***	0.00	/	
18	Time 2 behaviour	1.99	0.78	-0.09	0.06	-0.06	0.05	0.03	0.34	0.33	0.39	0.18	0.10	-0.36	0.12	0.16	0.05	0.09	-0.25	0.01	**0.94**

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Union membership (non-union members = 0, union members = 1) and age (16-25 years = 1, 26-35 years = 2, 36-45 years = 3, 46-55 years = 4, 56-65 years = 5) were both represented by dummy variables.

Note: The Time 2 behaviour results are based on the matched sample of 19

organisational commitment (r = 0.05, p = 0.80) or LSE (r = -0.11, p = 0.59), ***hypotheses 6, 7, 8*** and ***9*** are rejected.

Contrary to expectations, past behaviour is negatively related to intentions although not significantly (r = -0.27, p = 0.19). ***Hypothesis 10*** is rejected.

Past behaviour is not significantly related to attitude (r = 0.02, p = 0.91), subjective norm (r = 0.10, p = 0.63) or PBC (r = -0.05, p = 0.79). ***Hypotheses 11, 12*** and ***13*** are rejected. Past behaviour is, however, significantly positively correlated with LSE (r = 0.42, $p < 0.05$), providing support for ***hypothesis 15***.

Contrary to expectations, union members (M = 5.86) had a more positive attitude than non-union members (M = 5.25, t = -1.37, df = 24, p = 0.18). ***Hypothesis 16*** is rejected Organisational tenure and attitude are negatively related, although not significantly (r = -0.10, p = 0.65). ***Hypothesis 17*** is rejected.

Although attitude is positively related to openness (r = 0.19, p = 0.34) and conscientiousness (r = 0.25, p = 0.21) and negatively with neuroticism (r = -0.20, p = 0.32), none of these correlations is significant. ***Hypotheses 20, 21*** and ***24*** are rejected. Extraversion and attitude are significantly positively correlated (r = 0.46, $p < 0.05$), providing support for ***hypothesis 22***. Agreeableness and attitude are unrelated (r = -0.03, p = 0.87). ***Hypothesis 23*** is rejected.

As expected, LSE is significantly positively correlated with openness (r = 0.61, $p <$ 0.01) and conscientiousness (r = 0.40, $p < 0.05$), providing support for ***hypotheses 25*** and ***26,*** respectively. Although LSE is positively related to extraversion (r = 0.19, p = 0.36) and agreeableness (r = 0.15, p = 0.46) and negatively to neuroticism (r = -0.31, p = 0.12), these correlations are non-significant. ***Hypotheses 27, 28*** and ***29*** are rejected.

Age and attitude are negatively related although not significantly (r = -0.13, p = 0.53). ***Hypothesis 31*** is rejected.

Table 6.3 summarises the hypotheses and the results.

Table 6:3: Summary Table of Hypotheses and Results

	Hypotheses	Supported
H1	The more positive are employees' attitudes towards their adopting of LBs, the stronger will be their intentions to engage in LBs	X
H2	The more positive are employees' subjective norms to adopt LBs, the stronger will be their intentions to engage in LBs	X
H3	The higher are employees' PBC with respect to adopting LBs, the stronger will be their intentions to engage in LBs	✓
H4	Intentions and future employee engagement in LBs will be positively related	X
H5	PBC will have a direct relationship with future engagement in LBs independent of intentions	X
H6	Attitudes to adopting LBs will mediate the positive relationship between job satisfaction and intentions to adopt LBs	X
H7	Attitudes to adopting LBs will mediate the positive relationship between organisational commitment and intentions to adopt LBs	X
H8	PBC will partially mediate the positive relationship between LSE and intentions to adopt LBs	X
H9	Attitude will partially mediate the positive relationship between LSE and intentions to adopt LBs	X
H10	The more that employees have engaged in LBs in the past, the stronger will be their intentions to adopt LBs	X
H11	The more that employees have engaged in LBs in the past, the more positive will be their attitudes towards adopting LBs	X
H12	The more that employees have engaged in LBs in the past, the more positive will be their subjective norms to adopt LBs	X
H13	The more that employees have engaged in LBs in the past, the greater will be their PBC with respect to adopting LBs	X
H14	The more that employees have engaged in LBs in the past, the greater will be their future engagement in LBs	X
H15	The more that employees have engaged in LBs in the past, the greater will be their LSE	✓
H16	Union members will have a more negative attitude towards their adoption of LBs than non-union members	X
H17	Organisational tenure and attitude to adopting LBs will be negatively related	X
H20	Openness and attitude towards adopting LBs will be positively related	X
H21	Conscientiousness and attitude towards adopting LBs will be positively related	X
H22	Extraversion and attitude towards adopting LBs will be positively related	✓
H23	Agreeableness and attitude towards adopting LBs will be positively related	X
H24	Neuroticism and attitude towards adopting LBs will be negatively related	X
H25	LSE will be positively correlated with openness	✓
H26	LSE will be positively correlated with conscientiousness	✓
H27	LSE will be positively correlated with extraversion	X
H28	LSE will be positively correlated with agreeableness	X
H29	LSE will be negatively correlated with neuroticism	X
H31	Age and attitude to adopting LBs will be negatively related	X

6.4.2.3. Predictors of Intentions

Because none of the non-TPB variables was significantly correlated with intentions, there was no value in including them in the regression model. Attitude, subjective norm and PBC were regressed onto intentions and explained a statistically significant 36.4% of the variance in intentions ($F_{\text{change } 3, 22} = 4.19, p < 0.05$). The only variable with a significant beta weight was PBC ($\beta = 0.58, p < 0.01$)[45] (see Table 6.4). The higher were employees' PBC with respect to adopting LBs, the stronger were their intentions to adopt LBs.

Table 6.4: Regression Analysis of Intentions to Adopt LBs

Predictor	R^2	F	β
Attitude	0.36	4.19	0.08
Subjective norm			-0.04
PBC			0.58**

** $p < 0.01$

Following Field's (2000) recommendations, the validity of the model was analysed. None of the cases had a Cook's distance greater than 1. Although one case had a leverage value greater than three times the average leverage value, suggesting that this case was exerting undue influence over the model (Stevens, 1992), re-running the regression with this case omitted did not change the pattern of results obtained. Mahalanobis distances were examined and all were acceptable (Barnett & Lewis, 1978). All 100% of cases had standardised residuals between -2 and +2 indicating that the model represents a reasonable fit to the sample data (Field, 2000). The Durbin Watson statistic (2.13) was acceptable, suggesting that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity

[45] A logistic regression revealed similar results. The TPB predictors significantly improved the constant-only model ($X^2 = 12.67, p < 0.01$) and PBC was the only significant independent predictor of intentions ($p < 0.05$).

between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance statistics were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). Overall, the predictive validity of the model was acceptable. However, the calculated value of adjusted R^2 (0.277) and the observed value of R^2 (0.364) suggests that the cross-validity of the model is quite poor.

6.4.2.4. TPB Predictors as Mediators of Personality-intentions Relations

Because none of the five personality traits was significantly correlated with intentions and one of the conditions for mediation is that the predictor variable (personality) and outcome variable (intentions) are significantly related (Baron & Kenny, 1986), there are insufficient grounds to test the mediating role of the TPB predictors in the personality-intentions relations.

6.4.2.5. Personality as Moderator of TPB Predictor-intentions Relations

To explore the potential moderating role of personality on TPB predictor–intentions relations, interaction dummy variables were created between each of the personality variables and attitude, subjective norm and PBC. The variables were mean-centred prior to constructing the interaction variables to minimise problems of multicollinearity commonly found with interaction terms (Aiken & West, 1991). Based on Anguinis and Stone-Romero's (1997) concerns about the lack of power in moderated regression analyses to detect moderation effects, the interaction terms were entered using the stepwise method. The attitude-intentions relation was investigated first. A hierarchical regression was conducted with intentions as the dependent variable. Attitude was entered at step 1 using forced entry, openness was entered at step 2 using forced entry and the attitude-openness interaction dummy variable was entered at step 3 using stepwise entry[46]. No significant interaction was found, suggesting that openness does not moderate the attitude-intentions relation.

[46] The approach assumed was in accordance with Baron and Kenny (1986) and was the same as that adopted by Rhodes et al. (2005) in their investigation into the moderating role of personality within the TPB.

This procedure was repeated for each of the other four personality traits[47]. The only significant interaction effect found was for the moderating role of agreeableness (β = 0.40, $p < 0.05$). The agreeableness variable was already split into people with high and low agreeableness scores because, as noted in Section 6.4.2.2, the agreeableness variable was not normally distributed. It was therefore deemed appropriate to explore the nature of this interaction by comparing the regression results across these two levels of agreeableness. Intentions were regressed onto attitude separately for the two groups. Attitude was a significant positive predictor of intentions for respondents with high levels of agreeableness ($\beta = 0.54$, $p < 0.05$) but a non-significant negative predictor of intentions for respondents with low levels of agreeableness ($\beta = -0.43$, $p = 0.34$).

Repeating this procedure for the subjective norm-intentions relation revealed that the only significant moderator was neuroticism ($\beta = -0.70$, $p < 0.05$). Because the subjective norm and intentions variables were dichotomised, there was limited variance in these variables to conduct regressions on different levels of neuroticism. The spearman rho correlations for people with low (mean – 1 standard deviation), moderate (mean) and high (mean + 1 standard deviation) levels of neuroticism were therefore compared using the raw data. Subjective norm was a stronger predictor of intentions under low (rho = 1, $p < 0.001$) than moderate (rho = 0.23, $p = 0.36$) or high (rho = 0.63, $p = 0.37$) levels of neuroticism. Subjective norm was only a significant predictor of intentions for respondents with low levels of neuroticism. Repeating the procedure for the PBC-intentions relation revealed no significant interactions. Personality does not moderate the PBC-intentions relation.

6.4.2.6. Predictors of Time 2 Behaviour

None of the TPB or non-TPB variables were significant predictors of Time 2 behaviour and therefore a regression was not conducted. However, there were a number of variables that had moderately high correlations with Time 2 behaviour. These included, in descending order, past behaviour ($r = 0.39$, $p = 0.10$), agreeableness ($r = -0.36$, $p = 0.14$), job satisfaction ($r = 0.34$, $p = 0.16$),

[47] The personality traits were explored individually because of the moderately small sample size.

organisational commitment (r = 0.33, p = 0.17) and union membership (r = -0.25, p = 0.31). This suggests that the more employees had engaged in LBs in the past; the less agreeable they were; the higher their job satisfaction; and the higher their organisational commitment; the more likely they were to engage in LBs at Time 2. Non-union members were more likely to engage in LBs at Time 2 compared to union members. It is worth noting the very weak correlations between Time 2 behaviour and the TPB constructs (intentions, r = -0.09, p = 0.73; attitude, r = 0.06, p = 0.81; subjective norm, r = 0.05, p = 0.84; PBC, r = 0.03, p = 0.91). This suggests that the relationships between Time 2 behaviour and past behaviour, agreeableness, job satisfaction, organisational commitment and union membership are independent of the TPB variables.

6.4.2.7. Personality as Moderator of Intentions-behaviour Relation

The same procedure described in Section 6.4.2.5 was followed to explore the potential moderating role of personality on the intentions-behaviour relation. The personality traits were explored individually due to the small sample size. No significant interactions were found. Personality does not moderate the intentions-behaviour relation.

6.4.2.8. Personality and LSE

A regression was conducted to determine which of the personality traits were significant independent predictors of LSE. LSE was regressed onto conscientiousness and openness only because they were the only traits significantly correlated with LSE. Together they explained a statistically significant 40.6% of the variance in LSE (R^2 = 0.41, $F_{\text{change } 2, 24}$ = 8.21, $p < 0.01$). Openness was the only trait with a significant beta weight (see Table 6.5). The higher employees scored on openness, the higher their LSE.

Table 6.5: Regression Analysis of LSE

Predictor	R^2	F	β
Conscientiousness	0.41	8.21	0.22
Openness			0.53**

** $p < 0.01$

The validity of the model was analysed. None of the cases had a Cook's distance greater than 1 or a leverage value greater than three times the average leverage value, suggesting that none of the cases were exerting excessive influence over the model (Cook & Weisberg, 1982; Stevens, 1992). Mahalanobis distances were examined and all were acceptable (Barnett & Lewis, 1978). A large majority (96.3%) of cases had standardised residuals between -2 and +2. Although one case had a standardised residual of 2.24 which represented 3.4% of the sample, re-running the regression with this case dropped did not change the pattern of results obtained. The Durbin Watson statistic (1.91) was close to 2, suggesting that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance statistics were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). The calculated value of adjusted R^2 (0.357) and the observed value of R^2 (0.406) suggest that if the model were generated from the population rather than the sample, it would explain approximately 4.9% less of the variance in LSE. The cross-validity of the model is therefore quite good. To summarise, the predictive validity of the model seems acceptable.

6.4.2.9. Analysis of Belief Data

The first column in Table 6.6 lists the beliefs generated in the interviews, the salient referents and the PBC items. The second column reports the percentage of the questionnaire sample who reported the belief (i.e., they responded 1, 2 or 3 to the belief statement). The behavioural beliefs of respondents, in descending order, were

that their adoption of LBs would help Arvin save time and money (85.1%, n = 23), help employees to work more efficiently (85.1%, n = 23), increase profits (74.0%, n = 20), improve work performance (70.3%, n = 19), improve processes (65.4%, n = 17), increase productivity (59.2%, n = 16), improve quality of products (51.8%, n = 14), increase job stress (48.1%, n = 13), increase workload (48.1%, n = 13), increase work motivation (38.4%, n = 10), increase job satisfaction (37.0 %, n = 10), contribute to job losses at Arvin (29.6%, n = 8), contribute to jobs not being completed on time (29.6%, n = 8), increase the number of errors made (29.6%, n = 8), give employees more time to develop new ideas (25.9%, n = 7), contribute to a decline in customer satisfaction (18.5%, n = 5) and contribute to the site closing (7.7%, n = 2).

The sample was divided into two groups, intenders (employees who had a mean intentions score above the neutral point of zero, n = 21) and non-intenders (employees with a mean intentions score on or below the neutral point of zero, n = 5). The means and standard deviations of intenders and non-intenders for the behavioural belief, (BB) outcome evaluation (OE), BB*OE, normative belief (NB), motivation to comply (MC), NB*MC, and PBC data are reported in Table 6.6.

A series of Kolmogorov-Smirnov tests indicated that many all of the variables listed in Table 6.6 were significantly abnormally distributed. These are highlighted in bold. To determine any significant differences between intenders and non-intenders, independent t tests were conducted on the normally distributed variables and Mann Whitney U tests, on the abnormally distributed variables. The results from these tests are reported in Table 6.6.

6.4.2.9.1. Behavioural Beliefs

For the multiplicative measures of behavioural belief by outcome evaluation, significant differences were found for "help Arvin save time and money", "increase my work motivation" and "increase my job satisfaction". To extract greater meaning from the data, differences between intenders and non-intenders across the behavioural belief and outcome evaluation variables are explored.

Table 6.6: Percentages Reporting Beliefs and Differences between Non-intenders and Intenders (all Time 1 respondents, $n = 27$)

	% with belief	Behavioural Beliefs (BB) Non-intenders M	SD	Intenders M	SD		Outcome Evaluations (OE) Non-intenders M	SD	Intenders M	SD		BB*OE Non-intenders M	SD	Intenders M	SD		Correlation between belief and direct attitude
Help Arvin save time and money	85.1	**0.40**	1.52	**1.57**	0.81		**2.80**	0.45	**2.62**	0.59		0.80	4.09	4.33	2.56	*	0.71***
Help me to work more efficiently	85.1	**1.00**	1.23	**1.38**	0.81		**3.00**	0.00	**2.33**	0.80	*	3.00	3.67	3.24	2.43		0.49*
Increase profits at Arvin	74.0	**0.20**	1.30	**1.05**	1.28		**3.00**	0.00	**2.67**	0.58		**0.60**	3.91	**2.67**	3.69		0.40*
Improve my work performance	70.3	**0.20**	1.48	**1.00**	0.89		**2.60**	0.89	**2.24**	1.04		0.60	4.45	2.71	2.63		0.66***
Improve processes at Arvin	65.4	**0.50**	1.73	**0.81**	1.33		**2.50**	0.58	**2.33**	0.80		**-0.67**	4.62	**1.90**	3.81		0.41*
Increase productivity at Arvin	59.2	**0.00**	1.23	**0.57**	1.66		**3.00**	0.00	**2.48**	0.87		**0.00**	3.67	**1.14**	4.84		0.31
Improve quality of Arvin products	51.8	-0.20	1.30	0.62	1.32		**2.40**	1.34	**2.81**	0.40		**0.00**	3.67	**1.81**	3.96		0.44*
Make my job more stressful	48.1	**0.60**	1.34	**0.33**	1.59		**-3.00**	0.00	**-1.90**	1.18	*	**-1.80**	4.02	**-0.90**	3.77		-0.38*
Increase my workload	48.1	**0.40**	1.14	**0.76**	1.14		**-2.00**	2.24	**-0.71**	1.23	*	**-2.20**	2.49	**-0.48**	1.63		-0.24
Increase my work motivation	38.4	**-1.00**	1.00	**0.50**	0.89	*	**3.00**	0.00	**2.43**	0.81		**-3.00**	3.00	**1.20**	2.57	*	0.46*
Increase my job satisfaction	37.0	**-1.00**	1.00	**0.62**	1.20	*	**2.80**	0.45	**2.38**	0.92		**-2.60**	2.61	**1.62**	3.38	*	0.35
Contribute to job losses at Arvin	29.6	-0.80	1.79	-0.24	1.73		**-3.00**	0.00	**-2.33**	0.97		**2.40**	5.37	**0.00**	4.16		0.10
Contribute to jobs not being completed on time	29.6	**0.60**	1.14	**-0.57**	1.57		**-1.60**	2.61	**-1.76**	2.07		-0.80	3.70	2.71	3.72		-0.59**
Increase the number of errors made	29.6	**0.20**	1.30	**-0.38**	1.72		**-3.00**	0.00	**-2.62**	1.07		**-0.60**	3.91	**1.14**	5.15		-0.41*
Give me more time to develop new ideas	25.9	**-0.60**	1.52	**-0.10**	1.14		**2.80**	0.45	**1.90**	1.00	*	**-1.80**	4.55	**-0.14**	2.94		0.16
Contribute to a decline in customer satisfaction	18.5	**0.20**	1.79	**-1.19**	1.60		**-3.00**	0.00	**-2.33**	1.62		-0.60	5.37	3.10	5.00		-0.67***
Contribute to this site closing	7.7	**-0.75**	1.50	**-1.57**	1.43		**-3.00**	0.00	**-2.52**	1.21		**2.25**	4.50	**4.90**	4.02		-0.56**

Salient referents	% with belief	Normative Belief (NB) Non-intenders M	SD	Intenders M	SD		Motivation to Comply (MC) Non-intenders M	SD	Intenders M	SD		NB*MC Non-intenders M	SD	Intenders M	SD	
Most people important to me	25.9	**-0.60**	1.34	**0.43**	0.98		**6.00**	0.71	**5.76**	0.70		**-3.60**	8.05	**2.48**	5.58	
Co-workers	25.9	**-0.80**	1.10	**0.19**	0.75	*	**5.60**	1.14	**5.67**	0.80		**-4.40**	6.39	**1.05**	4.30	*
Manager/supervisor	63.0	**1.20**	1.30	**1.10**	0.94		**5.80**	0.84	**6.14**	0.48		**6.60**	6.84	**6.81**	6.13	

PBC Items	% with belief	Non-intenders M	SD	Intenders M	SD	
Adopting LBs at this company in the next 6 months is easy for me to do	74.1	**0.20**	1.64	**1.10**	1.00	
I feel confident that I can adopt LBs at this company in the next 6 months	81.5	**0.20**	1.64	**1.38**	0.74	
If I wanted to, I could easily adopt LBs at this company in the next 6 months	77.8	**-0.20**	1.79	**1.33**	0.73	*
There are few barriers to my adopting LBs at this company in the next 6 months	46.2	**-1.00**	1.83	**0.62**	1.07	
I can control whether I decide to adopt LBs at this company in the next 6 months	33.3	-1.80	1.30	0.14	1.59	*

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; M = mean, SD = standard deviation. Means in bold represent abnormally distributed data and where Mann Whitney U tests were used to detect any significant differences.

Unlike non-intenders, intenders were significantly more likely to believe that adopting LBs would increase their work motivation (U = 14.00, $p < 0.05$) and increase their job satisfaction (U = 16.50, $p < 0.05$). Several differences between intenders and non-intenders were detected which were relatively close to statistical significance. Compared to non-intenders, intenders generally expressed stronger beliefs that adopting LBs would help Arvin save time and money (U = 26.00, $p = 0.07$) and increase profits (U = 30.00, $p = 0.13$).

Other differences were clearly non-significant, and related to beliefs that adopting LBs would improve work performance (U = 34.50, $p = 0.21$), contribute to the site closing, (U = 26.50, $p = 0.23$), contribute to job losses ($t = -0.65$, $df = 24$, $p = 0.52$), increase workload (U = 43.50, $p = 0.54$), help employees to work more efficiently (U = 45.00, $p = 0.60$), give employees more time to develop new ideas (U = 45.00, $p = 0.61$), make jobs more stressful (U = 49.50, $p = 0.82$) and improve processes (U = 40.00, $p = 0.88$).

Non-intenders expressed neutral beliefs concerning whether adopting LBs would increase productivity, whereas intenders believed that this would be an outcome (U = 36.50, $p = 0.29$). Unlike intenders, non-intenders generally believed that outcomes would include a decline in customer satisfaction (U = 28.50, $p = 0.11$), jobs not being completed on time (U = 29.00, $p = 0.12$) and an increase in the number of errors made (U = 42.00, $p = 0.48$). Non-intenders did not expect improved quality of products to be an outcome whereas intenders did ($t = -1.25$, $df = 24$, $p = 0.22$). None of these differences were, however, statistically significant.

Compared to intenders, non-intenders were significantly more likely to evaluate positively the outcomes "help me to work more efficiently" (U = 25.00, $p < 0.05$) and "giving me more time to develop new ideas" (U = 23.00, $p < 0.05$), and to evaluate negatively the outcomes "make my job more stressful" (U = 22.50, $p < 0.05$) and "increase my workload" (U = 22.50, $p < 0.05$). Several differences between intenders and non-intenders were detected which were relatively close to statistical significance. Compared to intenders, non-intenders were slightly more likely to evaluate positively the outcomes "increase my work motivation" (U = 32.50,

$p = 0.11$) and "increase productivity at Arvin" ($\underline{U} = 35.00, p = 0.14$), and to evaluate negatively the outcome "contribute to job losses at Arvin" ($\underline{U} = 30.00, p = 0.08$).

Other differences were clearly non-significant, and related to the outcomes "increase profits at Arvin" ($\underline{U} = 37.50, p = 0.18$), "contribute to a decline in customer satisfaction" ($\underline{U} = 42.50, p = 0.30$), "increase my job satisfaction" ($\underline{U} = 41.00, p = 0.38$), "increase the number of errors made" ($\underline{U} = 45.00, p = 0.38$), "contribute to this site closing" ($\underline{U} = 45.00, p = 0.38$), "improve my work performance" ($\underline{U} = 41.50, p = 0.41$), "help Arvin save time and money" ($\underline{U} = 45.00, p = 0.55$), "improve quality of Arvin products" ($\underline{U} = 50.00, p = 0.81$), "improve processes at Arvin" ($\underline{U} = 39.00, p = 0.81$) and "contribute to jobs not being completed on time" ($\underline{U} = 52.50, p = 1.00$).

6.4.2.9.2. Direct Attitude and Behavioural Beliefs

As shown in Table 6.2, the correlation between the direct and indirect attitude measures was statistically significant ($r = 0.62, p < 0.01$). The final column in the top panel of Table 6.6 shows the correlations between each of the behavioural beliefs and direct attitude.

Given the small sample size, it was deemed inappropriate to conduct a regression on these data but rather to consider the size of the correlations between the behavioural beliefs and direct attitude. Employees were significantly more likely to have an overall positive attitude towards adopting LBs if they believed that doing so would, in descending order, help Arvin save time and money ($r = 0.71, p < 0.001$), not contribute to a decline in customer satisfaction ($r = -0.67, p < 0.001$), improve their work performance ($r = 0.66, p < 0.001$), not contribute to jobs not being completed on time ($r = -0.59, p < 0.01$), not contribute to the site closing ($r = -0.56, p < 0.01$), help employees to work more efficiency ($r = 0.49, p < 0.05$), increase work motivation ($r = 0.46, p < 0.05$), improve the quality of products ($r = 0.44, p < 0.05$), improve processes ($r = 0.41, p < 0.05$), not increase the number of errors made ($r = -0.41, p < 0.05$), increase profits ($r = 0.40, p < 0.05$) and not make their job more stressful ($r = -0.38, p < 0.05$).

6.4.2.9.3. Normative Beliefs

A significant difference was found for the co-worker multiplicative measure of normative belief by motivation to comply.

Intenders believed that their co-workers would slightly approve of their adopting LBs whereas non-intenders did not ($\underline{U} = 25.00$, $p < 0.05$). Intenders were somewhat more likely than non-intenders to believe that most people important to them would approve of their adopting LBs ($\underline{U} = 32.00$, $p = 0.13$). Intenders and non-intenders expressed almost the same endorsement of the belief that their manager/supervisor would approve of their adopting LBs ($\underline{U} = 51.00$, $p = 0.92$).

There were no differences between intenders and non-intenders with respect to motivation to comply with their manager/supervisor ($\underline{U} = 38.00$, $p = 0.25$), with most people important to them ($\underline{U} = 44.00$, $p = 0.52$) or with co-workers ($\underline{U} = 51.50$, $p = 0.94$).

6.4.2.9.4. PBC Items

Unlike non-intenders, intenders believed that they could easily adopt LBs if they wanted to ($\underline{U} = 24.50$, $p < 0.05$) and that they could slightly control whether they decided to adopt LBs ($t = -2.53$, $df = 24$, $p < 0.05$). Unlike non-intenders, intenders were somewhat more inclined to believe that there were few barriers to their adopting LBs ($\underline{U} = 20.00$, $p = 0.09$). Intenders were somewhat more likely than non-intenders to feel confident adopting LBs ($\underline{U} = 28.50$, $p = 0.09$). However, there was no statistically significant difference between intenders and non-intenders with respect to beliefs about how easy it would be for them to adopt LBs ($\underline{U} = 34.50$, $p = 0.22$).

6.5. Summary of Results

Although Arvin respondents held a number of positive behavioural beliefs about adopting LBs, a number of negative behavioural beliefs were also reported. Intenders generally expressed greater endorsement of the positive beliefs whereas non-

intenders generally expressed greater endorsement of the negative beliefs. Attitude, subjective norm and PBC explained 36.4% of the variance in intentions although PBC was the only significant independent predictor. None of the non-TPB variables were significantly correlated with intentions. Time 2 behaviour was very weakly correlated with all the TPB constructs, but had a moderately high negative relationship with agreeableness and union membership, and a moderately high positive relationship with past behaviour, job satisfaction and organisational commitment. These relationships were independent of the TPB constructs. Agreeableness moderated the attitude-intentions relation and neuroticism moderated the subjective norm-intentions relation. Openness was the only personality trait with a significant independent effect on LSE.

Chapter 7 – Cardiff University

7.1. Introduction

Rizla, Ivax and Arvin respondents overall held favourable beliefs about adopting LBs, and intenders were more likely to hold favourable beliefs than non-intenders. Attitude, subjective norm and PBC explained 32%, 50.4% and 36.4% of the variance in intentions among Rizla, Ivax and Arvin respondents, respectively. All three TPB predictors were significant independent predictors of intentions among Ivax respondents but only PBC was significant among Rizla and Arvin respondents. Consistently across the samples, the non-TPB variables did not predict intentions independently of the TPB variables. Past behaviour, LSE, neuroticism, employee level and union membership all had significant effects on the Time 2 behaviour of Ivax respondents independently of the TPB variables. Among Arvin respondents, Time 2 behaviour was highly correlated with past behaviour, agreeableness, job satisfaction, organisational commitment and union membership, independently of the TPB variables. The fourth participating organisation was Cardiff University based in South Wales, UK.

7.2. Background to CU

CU was founded by the Royal Charter in 1883 and is a member of the Russell Group of Britain's leading research universities. With an annual turnover of around £315 million and 5,500+ staff, high quality teaching and research are undertaken in each of its 28 Schools. CU increased in size and diversity in 2004 following merger with the Welsh National School of Medicine.

The University's mission is to pursue high quality, internationally recognised research, learning and teaching, encompassing excellence, integrity and innovation. To help realise this vision, the Vice Chancellor decided in mid-2006 after a series of meetings with the Director of CU's Lean Enterprise Research Centre, to invest money into making CU a Leaner, more efficient institution. A Central Lean Team was appointed in late 2006 to raise awareness of the Lean University (LU) initiative

across the University and to support and facilitate Lean improvement, of which delivery of appropriate communication and training to staff was a part. In December 2006, an article about the initiative appeared in the Cardiff News, a University-wide monthly newsletter (see Appendix F).

As part of the Lean implementation process and to inform communication and training about the initiative, the University was keen to gather information on employee perceptions and expectations of Lean. The LU project leader was particularly interested in staff perceptions of Lean because informal discussions she had had with various employees across the University suggested that some staff felt that Lean equated to job losses and increased work pressures. The University and Central Lean Team were therefore keen for the researcher to undertake the current study.

7.3. Data Collection

Ideally, the researcher would like to have used the same data collection instruments and procedure across all the participating organisations in order to facilitate cross-organisation comparisons and to enable all the research objectives to be met in four very different organisations. However, a slightly different approach was required at CU. To help inform university-wide communication about Lean, the University wanted to capture data on employee beliefs about adopting LBs from a large sample of employees across different Directorates and Schools during the initial stages of the Lean implementation[48]. They therefore requested the researcher to use questionnaires rather than interviews to identify employee beliefs about adopting LBs.

[48] CU consists of seven directorates (Corporate Services; Human Resources; Information Services; Physical and Financial Resources; Registry; Strategic Development; and Student Support and Development) and twenty-nine schools (Architecture; Biosciences; Business; Chemistry; City and Regional Planning; Computer Science; Dentistry; Earth, Ocean and Planetary Sciences; Engineering; English, Communication and Philosophy; European Studies; Healthcare Studies; History and Archaeology; Journalism, Media and Cultural Studies; Law; Lifelong Learning; Manufacturing Engineering Centre; Mathematics; Medicine; Music; Nursing and Midwifery Studies; Optometry and Vision Sciences; Pharmacy; Physics and Astronomy; Postgraduate Medical and Dental Education; Psychology; Religious and Theological Studies; Social Sciences; and Welsh).

It was decided not to conduct interviews at CU for several reasons: the primary purpose of the interviews was belief identification and the questionnaire was now going to be used for this purpose; as will be discussed in the following section, a single-item, global rating of job satisfaction was used and hence it was not necessary to collect data on the job characteristics employees particularly like/dislike; having been a member of staff at the University for over three years, the researcher had reasonable knowledge of the culture within the University and previous change programmes that had taken place.

7.3.1. Questionnaire Content

The University expressed concerns about administering such a lengthy questionnaire and asked the researcher to reduce its length by about one half. The researcher carefully considered ways in which this could be achieved without compromising the ability of the researcher to meet at least some of the research objectives with a large sample of university employees. It is not uncommon for researchers to have to revise their instruments, methods or approach to secure participation from organisations (Brewerton & Millward, 2001; Bryman, 1989). Apart from the differences detailed below, the content of the Time 1 questionnaire was the same as that used with the other participating organisations.[49]

Job Satisfaction. Warr et al.'s (1979) job satisfaction scale contains a global rating of job satisfaction (Considering everything, how do you feel about your job as a whole?). To reduce the length of the questionnaire, this single item was used to measure job satisfaction. Responses available were 'extremely dissatisfied', 'very dissatisfied', 'quite dissatisfied', 'neither satisfied nor dissatisfied', 'quite satisfied', 'very satisfied' and 'extremely satisfied', which were translated into 0, 1, 2, 3, 4, 5 and 6, respectively for data analysis. The researcher felt confident that the single-

[49] Note that BOS does not assign numbers to response labels and hence the responses in the questionnaire were translated into numbers for subsequent data analysis. Hence, responses to the past behaviour and Time 2 behaviour questions were translated from 'not at all', 'just a little', 'a reasonable amount', 'quite a lot' and 'a great deal' to 0, 1, 2, 3 and 4, respectively; responses to the LSE questions were translated from 'not at all confident', 'a little confident', 'reasonably confident', 'quite confident' and 'very confident' to 0, 1, 2, 3 and 4, respectively; extremely good/sensible/valuable/right became 7, good/sensible/valuable/right became 6, quite good/sensible/valuable/right became 5, the midpoint became 4, quite bad/foolish/worthless/wrong became 3, bad/foolish/worthless/wrong became 2 and extremely bad/foolish/worthless/wrong became 1; 'extremely unlikely', 'quite unlikely'. 'slightly unlikely', 'neither likely nor unlikely', 'slightly likely', 'quite likely' and 'extremely likely' became -3, -2, -1, 0, 1, 2 and 3, respectively.

item would be a sufficient measure of job satisfaction because a meta-analysis by Wanous, Reichers and Hudy (1997) revealed a high correlation between single-item and multiple-item measures of overall job satisfaction (r = 0.67) which led the authors to conclude that single-item measures are acceptable when time or space constraints prevent the use of longer scales.

Organisational Commitment. As a measure of organisational commitment, respondents reported their agreement with the statement 'I am very committed to Cardiff University' using the responses 'strongly disagree', 'disagree', 'neither agree nor disagree', 'agree' and 'strongly agree', which were translated into 0, 1, 2, 3 and 4, respectively for data analysis. This measure is substantially shorter than Mowday et al.'s (1979) 15-item commitment scale and directly asks respondents how committed they feel towards CU.

Attitude – Indirect Measure. One way to substantially reduce the length of the Time 1 questionnaire would be to revise the indirect attitude measure. The questionnaires used at Rizla, Ivax and Arvin required respondents to rate the likelihood that their adoption of LBs would lead to each of the outcomes identified in the interviews/focus groups, and then to evaluate each of the outcomes. Given the absence of the interview/focus group data and the University's desire to capture the beliefs of adopting LBs from a wider sample of employees, all respondents were asked in the questionnaire what they thought would be the likely advantages and disadvantages of their adopting of LBs at CU in the next 6 months[50]. Open-ended questions such as this can be used in questionnaires to identify salient beliefs about performing a behaviour/set of behaviours (Ajzen & Fishbein, 1980). To keep the questionnaire reasonably short, respondents were not asked to evaluate these outcomes.

Employee Level. CU's HR department groups staff using the categories "admin support", "operational services", "technical services", "managerial–professional-specialist staff", "academic-teaching", "academic-research", and "academic-teaching and research". It was therefore considered appropriate to ask respondents to use these

[50]This question was asked after respondents were presented with the LSE questions because, as noted in Section 3.5.2.1, the LSE scale was used to define to respondents what was meant by 'adopting LBs'.

categories to describe their role within the University. "Other" was also offered as an option. For analysis relating to employee level, respondents who categorised themselves as "admin support", "operational services" or "technical services" would be classed as non-managers and those categorising themselves as "managerial–professional-specialist staff" would be classed as managers. Academics and those who responded "other" would not be included in the analyses relating to employee level because it would not be clear in which category they should reside.

Personality. Ideally, the researcher would have liked to have measured personality but recognising the importance of reducing the length of the questionnaire to secure University participation, this measure was omitted completely.

Email address. Respondents were asked to provide their email address. This was set as an optional question in order that respondents could submit their responses without answering this question if they so wished. This question was included to enable the researcher to only email the Time 2 questionnaire to individuals who had completed the Time 1 questionnaire. The researcher was, after all, only interested in the reported behaviours of the Time 1 respondents at Time 2. Given the optional status of this question, its inclusion in the questionnaire should not compromise the integrity of responses.

7.3.2. Questionnaire Procedure

For reasons discussed in Section 3.5.2, the Time 1 CU questionnaire was administered electronically via the link http://www.surveys.cardiff.ac.uk/cutime1/. The researcher obtained a list of the names of all 5615 CU employees from the HR department. Of these, 5040 had email addresses. The University preferred not to administer the questionnaire to all staff but to a random sample of 20%. The researcher arranged the list of employees with email addresses in alphabetical surname order and selected every fifth person to receive the questionnaire. This resulted in a final sample of 1008[51].

[51] It was agreed between the researcher and the University that having only employees with email addresses complete the questionnaire would enable the views of a sufficient range of university employees to be captured.

The researcher drafted a cover letter to email to employees (see Appendix G) which contained the questionnaire link and stressed to recipients that all replies would be treated in the strictest confidence and that data would only be reported in an aggregated form. Recipients were informed that the closing date for completed questionnaires would be three weeks from the date of the email, and that the opinions of people who felt that they had little knowledge of Lean or the LU initiative were still welcome[52]. The cover email was signed by the LU project leader because she had been involved at a practical level in many of the Lean activities across the University and the researcher felt that the questionnaire would carry more credence and response rates were likely to be higher if the project leader signed the cover letter.

Prior to sending out the questionnaire link, the researcher and project leader drafted an email to be sent to the School Managers (see Appendix H) and Heads of Directorates (see Appendix I) asking them to inform staff in their School/Directorate that they may receive an email from sbsl@groupwise.cardiff.ac.uk requesting them to complete a Lean survey. The Managers/Heads were asked to stress to staff the importance of completing the survey. The decision to have this pre-notification was based on research suggesting that informing people that they are likely to receive a questionnaire to complete can significantly increase response rates for e-mail surveys (Cook, Heath & Thompson, 2000; Murphy, Daley & Dalenberg, 1991; Rogelberg & Stanton, 2007; Taylor & Lynn, 1998). The researcher also felt that some staff receiving an unexpected email from an unknown email address about a questionnaire may, at a glance, deem it to be junk mail and not read it. The pre-notification would hopefully overcome this potential problem.

Subsequent to the 1008 email shot on 12th March 2007, the researcher received several emails suggesting that 12 of the email addresses were no longer in use, thus reducing the sample size to 996. 42 automatic out-of-office replies were also received. The researcher therefore chose to send the questionnaire to an additional 54 people using the same random selection method described above but, this time, with the 1008 already selected people omitted. Taking into account email addresses no longer in use, this resulted in a final sample size of 1050. A reminder email (see

[52] This was deemed appropriate given that many employees may not be aware of the Lean approach to working

Appendix J) was sent to the 1050 staff on 26th March 2007. Prior to sending the reminder email, a 15.2% response rate (n = 160) had been achieved. The final response rate by the 2nd April 2007 cut-off date was 20.4% (n = 214).

The University felt that the views of a much larger number of employees were needed. It was therefore agreed to invite more staff to complete the questionnaire. Using the same random selection method described above but omitting individuals who had already been emailed the questionnaire, the researcher selected a further 1000 people to receive the questionnaire on 10th April 2007. The researcher received several emails suggesting that 16 of the email addresses were no longer in use, reducing the sample size to 984. 15 automatic out-of-office replies were also received. The sample was therefore increased using the same random selection method with the remaining staff emails. Taking into account email addresses no longer in use, the final sample size for this second email shot was 1023. Prior to a reminder email sent on 24th April 2007, a 15.2% response rate (n = 156) had been achieved. By the 1st May 2007 cut-off date, the response rate was 20.1% (n = 206).

The Time 2 questionnaire cover email (Appendix K) including the weblink http://www.surveys.cardiff.ac.uk/cutime2/ was sent to individuals who had provided their email addresses when they completed the Time 1 questionnaire. The content of the questionnaire can be found in Appendix D. To meet Ajzen and Fishbein's (1980) 'principle of compatibility' requirements, staff were sent the Time 2 questionnaire exactly six months after they were sent the Time 1 questionnaire. 182 CU staff were emailed the Time 2 questionnaire on 12th September 2007 with a reminder email (see Appendix L) on 26th September 2007. The researcher received emails suggesting that 4 of the 182 had either left the University or that they had not received the email due to an incorrect email address. This resulted in a potential sample size of 178. Prior to sending the reminder email, a 23% (n = 41) response rate had been achieved. The final response rate by the 3rd October 2007 cut-off date was 33.7% (n = 60).

181 staff were emailed the Time 2 questionnaire on 10th October 2007. Emails were received suggesting that 10 people had either left the University or that they had not received the email due to an incorrect email address. The potential sample size was therefore 171. Prior to the reminder email on 24th October 2007, the response rate

was 28.7% (n = 49). The final response rate by the 31st October 2007 cut-off date was 39.2% (n = 67). Therefore, in total, 127 CU staff completed the Time 2 questionnaire, of which 121 of their data could be confidently matched using the participant generated passwords and demographic data.

7.4. Results

7.4.1. Respondent Sample Characteristics

Averaging the response rates from the two Time 1 email shots resulted in a 20.25% response rate (n = 418). Averaging the response rates from the two Time 2 email shots resulted in a 36.45% response rate (n = 127). The Time 1 response rate is considerably lower than Baruch's (1999) recommended minimum 40% response rate. The Time 2 response rate is only slightly below 40%.

One of the main reasons for the low Time 1 response rate could be that many staff had never come across the term 'Lean' within an organisational context before and subsequently felt that the questionnaire was of little relevance and importance to them. A meta-analysis of www-based surveys found that a lack of topic salience among respondents can significantly reduce response rates (Cook et al., 2000). Bean and Roszkowski (1995) even suggest that salience has more influence on response rates than survey length - "...if a person attaches little interest or importance to the particular content of a survey, then it will not matter if the survey form is short; the person still is unlikely to respond" (p. 25). Despite emphasis in both the initial cover emails and the follow-up cover emails that the opinions of people who felt that they had little knowledge of Lean or the LU initiative were still welcome, the researcher received a number of emails from staff who indicated that they had decided not to complete the survey because they felt that it was of no relevance to them. The researcher responded to such emails by emphasising that their responses were still relevant and important to the University. Despite this, some staff may still have deemed the questionnaire irrelevant and subsequently not responded.

The average Time 2 response rate was noticeably higher than that achieved at Time 1. This is not surprising. The Time 2 questionnaire was only emailed to people who had

completed the Time 1 questionnaire and hence was targeted at a group of people who had already shown a willingness to complete a questionnaire of this nature.

Based on Tabachnick and Fidell's (2001) recommendation concerning the omission of outliers (any scores that are more than three standard deviations from the mean for a given variable), 4 cases were omitted from the attitude mean (two values of 1.00 and two of 1.25), 2 from the job satisfaction mean (both 'extremely dissatisfied' responses), 7 from the organisational commitment mean (all 'strongly disagree' responses), 2 from the LSE mean (values of 0.50 and 0.90) and 8 from the organisational tenure mean (three values of 36, two values of 41 and one value of 37, one of 38 and one of 40).

To check for the representativeness of the respondent samples on different job-related and demographic characteristics, the Time 1 respondent sample was compared to the whole CU sample at Time 1[53], and the Time 1 and Time 2 matched sample was compared to the Time 2 potential sample (see Table 7.1). The samples appear to be reasonably representative, although managers seemed more likely to complete the Time 1 questionnaire than would be expected based on the CU data. Presumably this is because managers are generally more likely to be aware of improvement initiatives such as Lean and hence to see the relevance and importance of the questionnaire.

[53] The management status, average organisational tenure, gender and age of the Time 1 questionnaire recipients could not be determined. Hence the Time 1 respondent sample was compared to the whole of CU employees at Time 1. These statistics are likely to be fairly representative of the Time 1 potential sample given the random method used to select questionnaire recipients.

Table 7.1: Comparison of Samples on Job-related and Demographic Characteristics

		Time 1 respondent sample (n = 418)	Whole CU sample at Time 1 (n = 5615)	Time 1 and Time 2 matched sample (n = 121)	Time 2 potential sample (n = 349)
Managers		54.1% (n = 138)	22.0% (n = 1236)	58.8% (n = 47)	54.5% (n = 120)
Average organisational tenure		8.30 years (SD = 7.97)	6.4 years[54]	8.19 years (SD = 8.02)	8.38 years (SD = 8.10)
Union members		37.3% (n = 156)	Data not available	34.7% (n = 42)	37.5% (n = 131)
Females		52.9% (n = 221)	51.6% (n = 1070)	53.7% (n = 65)	53.0% (n = 185)
Age	16-25 years	3.1% (n = 13)	Mean = 42.6 years[55]	4.1% (n = 5)	3.4% (n = 12)
	26-35 years	29.7% (n = 124)		20.7% (n = 25)	28.1% (n = 98)
	36-45 years	31.6% (n = 132)		32.2% (n = 39)	30.7% (n = 107)
	46-55 years	24.4% (n = 102)		31.4% (n = 38)	26.6% (n = 93)
	56-65 years	10.8% (n = 45)		11.6% (n = 14)	10.6% (n = 37)
	65+ years	0.5% (n = 2)		0% (n = 0)	0.6% (n = 2)

SD = standard deviation

[54] CU only provided the mean organisational tenure of employees, hence the absence of a standard deviation value

[55] CU only provided the mean age of their employees and not a breakdown into different age categories.

7.4.2. Descriptives and Hypothesis Testing

The means (M) and standard deviations for the variables are shown in Table 7.2[56]. CU respondents were fairly neutral with respect to intentions to adopt LBs (M = 0.15). They did, however, tend to report quite positive attitudes towards adopting LBs (M = 5.23). The subjective norm mean (M = 0.84) suggests that, on average, respondents were fairly neutral with respect to perceptions of whether significant others would support their adoption of LBs. The PBC mean (M = 0.37) suggests that respondents tended to perceive slight control with respect to adopting LBs. Respondents were generally quite satisfied with their job (M = 4.12) and committed to CU (M = 3.01). The past behaviour mean (2.44) and the Time 2 behaviour mean (2.37) suggest that respondents were engaging in LBs a fair amount at the time of completing the two questionnaires. On average, respondents reported feeling quite confident about adopting LBs (M = 3.06). Descriptives relating to organisational tenure, employee level, union membership, gender and age can be found in Table 7.1.

The Cronbach alpha scores for each of the measures are shown on the diagonal in Table 7.2. All the alphas are higher than 0.70, suggesting reliable measures (Hair et al., 1992; Nunnally, 1978).

Kolmogorov-Smirnov tests suggested that all the continuous variables listed in Table 7.2 were significantly abnormally distributed. However, as noted in Section 5.4.2.2, Kolmogorov-Smirnov tests should be interpreted with caution when dealing with large samples because small deviations from normality often lead to significant results (Field, 2000).

Because the Time 1 CU sample was quite large (n = 418), the histograms and distribution plots for each of the Time 1 continuous variables were analysed. All the histograms and plots suggested that the variables were reasonably normally distributed. Furthermore, the skewness and kurtosis values for each of the continuous variables were all between -1 and +1. The only exception was the organisational

[56] Intentions and PBC scores could range from -3 to 3, attitude scores from 1 to 7, subjective norm scores from -21 to 21, job satisfaction scores from 0 to 6 and organisational commitment, past behaviour, Time 2 behaviour and LSE scores from 0 to 4.

tenure variable which was very positively skewed (skewness value = 1.39). This variable was therefore dichotomised using the median split method [57] .183 respondents were given an organisational tenure value of zero to represent a score below the median and 227 were given a value of one to represent a score on or above the median. Analysing the histograms, distribution plots and skewness and kurtosis values for the other continuous variables suggested that dichotomising these variables was unnecessary.

The sample with matched Time 1 and Time 2 data (n = 121) was much smaller than the Time 1 sample. Although the Kolmogorov-Smirnov test indicated that the Time 2 behaviour variable was abnormally distributed, the histogram and distribution plot suggested otherwise. Furthermore, the skewness and kurtosis values were both between 0 and -1 (-0.24 and -0.66, respectively). It was concluded that the Time 2 behaviour variable was sufficiency normally distributed to render dichotomisation of this variable unnecessary.

The results are analysed in relation to each of the 31 hypotheses summarised in Section 2.6. It was not possible to test ***hypotheses 20*** to ***29*** because personality data was not collected.

Table 7.2 shows the Pearson correlations between the different variables. Intentions were significantly and positively correlated with attitude (r = 0.48, $p < 0.001$), subjective norm (r = 0.55, $p < 0.001$), PBC (r = 0.75, $p < 0.001$) and Time 2 behaviour (r = 0.32, $p < 0.001$), providing support for ***hypothesis 1, 2, 3*** and ***4,*** respectively. Of the TPB predictors, intentions had the strongest correlation with PBC, followed by subjective norm and then attitude. In descending order, intentions were also significantly positively correlated with past behaviour ($r = 0.28, p < 0.001$), job satisfaction (r = 0.23, $p < 0.001$), organisational commitment (r = 0.21, $p <$ 0.001), LSE ($r = 0.20, p < 0.001$), employee level ($r = 0.18, p < 0.01$, with managers reporting stronger intentions than non-managers) and gender ($r = 0.13, p < 0.01$, with

[57]To be consistent with the approach adopted with the Rizla and Arvin datasets, this variable was dichotomised rather than transformed.

Table 7.2: Means (M), Standard Deviations (SD), Zero-order Correlations and Alpha Coefficients (all respondents, $n = 418$)

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Intentions	0.15	1.53	**0.94**													
2	Attitude - Direct	5.23	0.91	0.48***	**0.94**												
3	Subjective norm	0.84	7.51	0.55***	0.34***	**0.88**											
4	PBC	0.37	1.41	0.75***	0.32***	0.44***	**0.90**										
5	Job satisfaction	4.12	1.17	0.23***	0.13**	0.11*	0.28***	/									
6	Organisational commitment	3.01	0.79	0.21***	0.20***	0.15**	0.12*	0.27***	/								
7	Past behaviour	2.44	0.71	0.28***	0.27***	0.20***	0.32***	0.39***	0.20***	**0.92**							
8	LSE	3.06	0.68	0.20***	0.36***	0.13**	0.19***	0.13**	0.13**	0.58***	**0.95**						
9	Organisational tenure (years)	8.30	7.97	0.07	-0.05	0.01	0.03	0.08	0.00	0.10*	0.09	/					
10	Employee level	0.54	0.50	0.18**	0.24***	0.17**	0.09	0.11	0.21***	0.49***	0.31***	0.08	/				
11	Union membership	0.37	0.48	0.04	-0.05	-0.05	-0.01	-0.05	-0.01	0.04	0.09	0.26***	0.12	/			
12	Gender	1.53	0.50	0.13**	0.12*	0.08	0.06	-0.06	-0.04	-0.12*	-0.14**	-0.05	-0.25***	-0.10*	/		
13	Age	3.11	1.06	-0.04	-0.08	-0.08	-0.04	0.14**	0.12*	0.14**	0.10	0.45***	0.15*	0.32***	-0.18***	/	
14	Time 2 behaviour	2.37	0.73	0.32***	0.27**	0.29***	0.36***	0.47***	0.28**	0.86***	0.54***	-0.08	0.60***	0.03	-0.01	0.03	**0.92**

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Employee level (non-managers = 0, managers = 1), union membership (non-union members = 0, union members = 1), gender (male = 1, female = 2), and age (16-25 years = 1, 26-35 years = 2, 36-45 years = 3, 46-55 years = 4, 56-65 years = 5, 65+ years = 6) were all represented by dummy variables.
Note: The Time 2 behaviour results are based on the matched sample of 121

females reporting stronger intentions than males). Of the TPB and non-TPB variables significantly correlated with intentions, PBC was by far the strongest correlate.

Time 2 behaviour was significantly positively correlated with past behaviour (r = 0.86, $p < 0.001$), providing support for ***hypothesis 14***. In descending order, Time 2 behaviour was also significantly and positively correlated with employee level (r = 0.60, $p < 0.001$, with managers reporting greater engagement in LBs than non-managers), LSE ($r = 0.54, p < 0.001$), job satisfaction ($r = 0.47, p < 0.001$), PBC (r = 0.36, $p < 0.001$), intentions (r = 0.32, $p < 0.001$), subjective norm (r = 0.29, $p <$ 0.001), organisational commitment (r = 0.28, $p < 0.01$) and attitude (r = 0.27, $p <$ 0.01). Of all the variables significantly correlated with Time 2 behaviour, past behaviour was by far the strongest correlate.

Using the steps to test for mediation proposed by Baron and Kenny (1986), a number of regressions were conducted to determine whether PBC had a direct relationship with Time 2 behaviour independent of intentions (***hypothesis 5***). The beta weight for the path between PBC and Time 2 behaviour with intentions in the equation is significant, albeit lower (β = 0.30, $p < 0.05$), than when intentions is not in the equation ($\beta = 0.36, p < 0.001$). The Sobel test was non-significant ($t = 0.57, p = 0.57$). This suggests that PBC has a direct relationship with Time 2 behaviour independent of intentions and ***hypothesis 5*** is supported.

Regressions were conducted to determine whether attitude mediates the positive job satisfaction-intentions relation (***hypothesis 6***). The beta weight for the path between job satisfaction and intentions with attitude in the equation is significant but lower (β = 0.17, $p < 0.001$) than when attitude is not in the equation ($\beta = 0.23, p < 0.001$). The Sobel test is significant (t = 2.57, $p < 0.01$). Because a significant beta weight between job satisfaction and intentions still exists with attitude in the equation, it is concluded that attitude is a partial rather than full mediator and that there is partial support for ***hypothesis 6***.

The beta weight for the path between organisational commitment and intentions with attitude in the equation is significant but lower (β = 0.11, p = 0.01) than when attitude is not in the equation ($\beta = 0.21, p < 0.001$). The Sobel test is significant (t =

3.82, $p < 0.001$). Because a significant beta weight between organisational commitment and intentions still exists with attitude in the equation, it is concluded that attitude is a partial rather than full mediator and that there is partial support for ***hypothesis 7***.

The beta weight for the path connecting LSE and intentions is significant ($\beta = 0.20, p < 0.001$). When PBC is entered, the beta weight becomes non-significant ($\beta = 0.06, p = 0.06$). The Sobel test is significant ($t = 3.88, p < 0.001$). This suggests that PBC fully mediates the LSE-intentions relation. When attitude is entered into the LSE-intentions equation, the beta weight reduces to non-significance ($\beta = 0.03, p = 0.49$). The Sobel test is significant ($t = 6.23, p < 0.001$). This suggests that attitude fully mediates the LSE-intentions relation. Logically, there cannot be two full mediators of a relationship. These findings may have occurred due to the significant correlation between attitude and PBC ($r = 0.32, p < 0.001$). It is concluded that the LSE-intentions relation is mediated by one underlying construct consisting of components of both attitude and PBC. ***Hypotheses 8*** and ***9*** are supported.

The more that employees engaged in LBs in the past, the stronger their intentions ($r = 0.28, p < 0.001$), the more positive their attitudes ($r = 0.27, p < 0.001$), the more positive their subjective norms ($r = 0.20, p < 0.001$), the greater their PBC ($r = 0.32, p < 0.001$) and the greater their LSE ($r = 0.58, p < 0.001$). ***Hypotheses 10, 11, 12, 13*** and ***15*** are supported.

Union members (M = 5.17) had a slightly more negative attitude than non-union members (M = 5.26), although this difference was non-significant ($t = 0.94, df = 412, p = 0.35$). ***Hypothesis 16*** is rejected.

Organisational tenure and attitude were almost unrelated ($r = -0.05, p = 0.30$). ***Hypothesis 17*** is rejected.

Compared to non-managers (M = 2.03), managers (M = 2.74) reported significantly greater past engagement in LBs ($t = -8.82, df = 253, p < 0.001$). ***Hypothesis 18*** is supported. Compared to non-managers, (M = 5.14), managers (M = 5.57) reported

significantly more positive attitudes towards adopting LBs (t = -3.99, df = 253, p < 0.001). ***Hypothesis 19*** is supported.

Females (M = 5.33) reported a significantly more positive attitude than males (M = 5.11, t = -2.47, df = 412, p < 0.05). ***Hypothesis 30*** is supported.

Age and attitude are negatively related although non-significantly (r = -0.08, p = 0.11). ***Hypothesis 31*** is rejected.

Table 7.3 summarises the hypotheses and results.

Table 7.3: Summary Table of Hypotheses and Results

	Hypotheses	Supported
H1	The more positive are employees' attitudes towards their adopting of LBs, the stronger will be their intentions to engage in LBs	✓
H2	The more positive are employees' subjective norms to adopt LBs, the stronger will be their intentions to engage in LBs	✓
H3	The higher are employees' PBC with respect to adopting LBs, the stronger will be their intentions to engage in LBs	✓
H4	Intentions and future employee engagement in LBs will be positively related	✓
H5	PBC will have a direct relationship with future engagement in LBs independent of intentions	✓
H6	Attitudes to adopting LBs will mediate the positive relationship between job satisfaction and intentions to adopt LBs	✓ Partial mediator
H7	Attitudes to adopting LBs will mediate the positive relationship between organisational commitment and intentions to adopt LBs	✓ Partial mediator
H8	PBC will partially mediate the positive relationship between LSE and intentions to adopt LBs	✓
H9	Attitude will partially mediate the positive relationship between LSE and intentions to adopt LBs	✓
H10	The more that employees have engaged in LBs in the past, the stronger will be their intentions to adopt LBs	✓
H11	The more that employees have engaged in LBs in the past, the more positive will be their attitudes towards adopting LBs	✓
H12	The more that employees have engaged in LBs in the past, the more positive will be their subjective norms to adopt LBs	✓
H13	The more that employees have engaged in LBs in the past, the greater will be their PBC with respect to adopting LBs	✓
H14	The more that employees have engaged in LBs in the past, the greater will be their future engagement in LBs	✓
H15	The more that employees have engaged in LBs in the past, the greater will be their LSE	✓
H16	Union members will have a more negative attitude towards their adoption of LBs than non-union members	X
H17	Organisational tenure and attitude to adopting LBs will be negatively related	X
H18	Managers will report greater past engagement in LBs than non-managers	✓
H19	Managers will report a more positive attitude towards their adoption of LBs than non-managers	✓
H30	Females will report a more positive attitude towards their adoption of LBs than males	✓
H31	Age and attitude to adopting LBs will be negatively related	X

7.4.3. Predictors of Intentions

A hierarchical regression was conducted. Attitude, subjective norm and PBC were entered at step 1 and explained a statistically significant 66.9% of the variance in intentions ($F_{\text{change } 3, 248} = 167.42$, $p < 0.001$). The strongest TPB predictor of intentions was PBC ($\beta = 0.59$, $p < 0.001$), followed by attitude ($\beta = 0.22$, $p < 0.001$) and subjective norms ($\beta = 0.22$, $p < 0.001$) in joint second. The higher employees' PBC were with respect to adopting LBs, or the more positive were their attitudes or subjective norms, the stronger were their intentions to adopt LBs. The non-TPB predictors significantly correlated with intentions (job satisfaction, organisational commitment, past behaviour, LSE, employee level, gender) were entered at step 2 and explained a non-significant 1.1% of the variance in intentions ($F_{\text{change } 6, 242} = 1.39$, $p = 0.22$). None of the non-TPB variables had a significant beta weight at this step but PBC, attitude and subjective norm all remained significant and positive independent predictors of intentions with PBC being the strongest predictor (see Table 7.4)[58].

Following Field's (2000) recommendations, the validity of the model was analysed. None of the cases had a Cook's distance greater than 1 or a leverage value greater than three times the average leverage value, suggesting that none of the cases were exerting excessive influence over the model (Cook & Weisberg, 1982; Stevens, 1992). Mahalanobis distances were examined and all were acceptable (Barnett & Lewis, 1978). 95.2% of cases had standardised residuals between -2 and +2 and 98.4% had standardised residuals between -2.5 and +2.5. This latter percentage is only slightly lower than the 99% recommended by Field (2000). It is concluded that the model represents a reasonable fit to the sample data. The Durbin Watson statistic (1.70) was fairly close to 2, suggesting that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance

[58] To acknowledge Norman and Conner's (2006) approach, the non-TPB predictors significantly correlated with intentions were entered at step 1 and explained a statistically significant 15.6% of the variance in intentions ($F_{\text{Change } 6, 245} = 7.53$, $p < 0.001$). Job satisfaction ($\beta = 0.14$, $p < 0.05$) and gender ($\beta = 0.20$, $p = 0.001$) were significant independent predictors at this step. The TPB predictors were entered at step 2 and explained a statistically significant 52.5% of the variance in intentions ($F_{\text{change } 3, 242} = 132.46$, $p < 0.001$). Job satisfaction ($\beta = 0.02$, $p = 0.71$) and gender ($\beta = 0.07$, $p = 0.06$) were no longer significant at this step. PBC ($\beta = 0.59$, $p < 0.001$), attitude ($\beta = 0.20$, $p < 0.001$) and subjective norm ($\beta = 0.21$, $p < 0.001$) were the only significant independent predictors at this step.

statistics were all well above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard, 1995; Myers, 1990). The calculated value of adjusted R^2 (0.669) and the observed value of R^2 (0.680) suggests that the cross validity of the model is very good. To conclude, the predictive validity of the model seems acceptable.

Table 7.4: Regression Analysis of Intentions to Adopt LBs

Step	Predictor	R^2	ΔR^2	F	β Step 1	β Step 2
1	Attitude	0.67	0.67	167.42	0.22***	0.20***
	Subjective norm				0.22***	0.21***
	PBC				0.59***	0.59***
2	Job satisfaction	0.68	0.01	57.25		0.02
	Organisational commitment					0.06
	Past behaviour					-0.05
	LSE					-0.01
	Employee level					0.08
	Gender					0.07

*** $p < 0.001$

7.4.4. Predictors of Time 2 Behaviour

A hierarchical regression was conducted with Time 2 behaviour as the dependent variable. Intentions and PBC were entered at step 1. Although they jointly explained a significant 13.4% of the variance in Time 2 behaviour ($F_{\text{change } 2, 76} = 5.87, p < 0.01$), neither intentions ($\beta = 0.08, p = 0.65$) nor PBC ($\beta = 0.30, p = 0.09$) was a significant independent predictor at this step. Intentions and PBC explained independently 10.1% and 13.1% of the variance in Time 2 behaviour, respectively[59].

[59] Independently' in this context means entering each predictor on its own, without controlling for the other one.

Subjective norm and attitude were entered at step 2 and explained a non-significant 2.5% of the variance in Time 2 behaviour ($F_{\text{change } 2, 74} = 1.12, p = 0.33$). None of the variables had significant beta weights at this step. The non-TPB predictors significantly correlated with Time 2 behaviour (job satisfaction, organisational commitment, past behaviour, LSE, employee level) were all entered at step 3 and explained a significant 61.4% of the variance in Time 2 behaviour ($F_{\text{change } 5, 69} = 37.34, p < 0.001$). In descending order, past behaviour ($\beta = 0.67, p < 0.001$) and employee level ($\beta = 0.19, p < 0.01$) were significant independent predictors and independently explained 58.3% ($F_{\text{change } 1, 73} = 165.01, p < 0.001$) and 2.4% ($F_{\text{change } 1, 72} = 7.44, p < 0.01$) of the variance in Time 2 behaviour, respectively. The more employees had engaged in LBs in the past, the more likely they were to report engaging in LBs at Time 2. Managers were more likely to report engaging in LBs at Time 2 compared to non-managers (see Table 7.5)[60]. Past behaviour and employee level had direct effects on Time 2 behaviour independently of the TPB variables.

The validity of the model was analysed. None of the cases had a Cook's distance greater than 1. Although one case had a leverage value slightly greater than three times the average leverage value and a large Mahalanobis distance, suggesting that it was exerting excessive influence over the model, removal of this case did not change the pattern of regression results obtained. 98.7% of cases had standardised residuals between -2 and +2 and 100% had standardised residuals between -2.5 and +2.5. These percentages meet Field's (2000) recommendations and suggest that the model represents a reasonable fit to the sample data. The Durbin Watson statistic (2.39) was fairly close to 2, suggesting that errors of prediction were independent of each other (Field, 2000). The presence of multicollinearity between independent variables was assessed. None of the VIFs was greater than 10 and the tolerance statistics were all above 0.2, suggesting the absence of concerning levels of multicollinearity (Menard,

[60] To acknowledge Norman and Conner's (2006) approach, the non-TPB variables significantly correlated with Time 2 behaviour were entered at step 1 and explained a statistically significant 76.5% of the variance in Time 2 behaviour ($F_{\text{change } 5, 73} = 47.47, p < 0.001$). Past behaviour ($\beta = 0.67, p < 0.001$) and employee level ($\beta = 0.19, p < 0.01$) were significant independent predictors at this step. Subjective norm and attitude were entered at step 2 and explained a non-significant 0.4% of the variance in Time 2 behaviour ($F_{\text{change } 2, 71} = 0.62, p = 0.54$). Past behaviour ($\beta = 0.67, p < 0.001$) and employee level ($\beta = 0.18, p = 0.01$) remained significant at this step. Intentions and PBC were entered at step 3 and explained a non-significant 0.4% of the variance in Time 2 behaviour ($F_{\text{change } 2, 69} = 0.65, p = 0.53$). Past behaviour ($\beta = 0.67, p < 0.001$) and employee level ($\beta = 0.19, p < 0.01$) were the only significant independent predictors at this step.

1995; Myers, 1990). The calculated value of adjusted R^2 (0.743) is close to the observed value of R^2 (0.773), suggesting that the cross validity of the model is quite good. To conclude, the predictive validity of the model seems acceptable.

Table 7.5: Regression Analysis of Predictors of Time 2 Behaviour

Step	Predictor	R^2	ΔR^2	F	β Step 1	β Step 2	β Step 3
1	Intentions	0.13	0.13	5.87	0.08	-0.05	0.12
	PBC				0.30	0.30	-0.05
2	Attitude	0.16	0.03	3.50		0.13	-0.08
	Subjective norm					0.11	0.04
3	Job satisfaction	0.77	0.61	26.12			0.04
	Organisational commitment						0.02
	Past behaviour						0.67***
	LSE						0.10
	Employee level						0.19**

*** $p < 0.001$, ** $p < 0.01$

The accuracy of a regression model decreases as the number of independent variables entered increases (Field, 2000). The sample size here was moderately small for the number of independent variables. The regression was repeated entering LSE, job satisfaction and organisational commitment individually at step 3 (i.e., in three separate regressions) to see whether these variables had direct effects on Time 2 behaviour independently of the TPB variables.

LSE was entered at step 3 and explained a statistically significant 21.1% of the variance in behaviour ($F_{\text{change } 1, 114} = 38.24$, $p < 0.001$) and was the only variable with a significant beta weight at this final step ($\beta = 0.50$, $p < 0.001$). This suggests that the higher an employee's LSE, the more likely they are to engage in LBs at Time

2 and that LSE has a direct effect on Time 2 behaviour independent of the TPB variables.

Job satisfaction was entered at step 3 and explained a statistically significant 12.7% of the variance in Time 2 behaviour ($F_{\text{change } 1, 113} = 20.10$, $p < 0.001$) and was the only variable with a significant beta weight at this final step ($\beta = 0.39$, $p < 0.001$). This suggests that the higher an employee's job satisfaction, the more likely they are to engage in LBs at Time 2 and that job satisfaction has a direct effect on Time 2 behaviour independent of the TPB variables.

Organisational commitment was entered at step 3 and explained a statistically significant 3.9% of the variance in Time 2 behaviour ($F_{\text{change } 1, 112} = 5.46$, $p < 0.05$). Organisational commitment ($\beta = 0.20$, $p < 0.05$) and PBC ($\beta = 0.28$, $p < 0.05$) were both significant independent predictors of behaviour at this final step. This suggests that the higher an employee's organisational commitment, the more likely they are to engage in LBs at Time 2 and that organisational commitment has a direct effect on Time 2 behaviour independent of the TPB variables.

7.4.5. Analysis of Belief Data

7.4.5.1. Behavioural Beliefs

Behavioural belief data were captured by asking respondents to state in the Time 1 questionnaire what they considered to be the advantages and disadvantages of their adopting of LBs. Table 7.6 lists the beliefs most frequently mentioned in the questionnaire and details the percentage of the total sample, of intenders (defined as people with a mean intentions score above zero, $n = 157$) and of non-intenders (defined as people with a mean intentions score on or below zero, $n = 261$) who mentioned each belief.

To assess the reliability of the researcher's codings, a random 10% of the questionnaires were selected and the responses to the open-ended belief questions were re-coded by an independent rater. The researcher provided the rater with the researcher's list of frequently mentioned beliefs and asked them to record whether

the respondent had mentioned each of those beliefs. The researcher then calculated the number of agreements and subtracted from that the number of disagreements. This result was then divided by the total number of judgements made. The researcher and fellow rater agreed on 96% of the judgements. The rater confirmed that the belief list generated by the researcher was a true reflection of the most frequently mentioned beliefs.

Table 7.6: Percentages Reporting Different Beliefs About Adopting LBs

	Whole sample (n = 418)		Intenders (n = 157)		Non-intenders (n = 261)		Chi Square[61]	Correlation with direct attitude
Advantages of adopting LBs	%	*n*	%	*n*	%	*n*		
Greater efficiency and effectiveness	18.2	76	28.0	44	12.3	32	$X^2 = 16.38$***	0.29***
Saving time/better time management	10	42	14.6	23	7.3	19	$X^2 = 5.89$*	0.09
Improve/streamline procedures	6.9	29	9.6	15	5.4	14	$X^2 = 2.67$	0.07
Improve performance/productivity	4.5	19	5.7	9	3.8	10	$X^2 = 0.82$	0.13**
Less bureaucracy/red tape	4.3	18	6.4	10	3.1	8	$X^2 = 2.60$	0.06
Less duplication	3.8	16	5.1	8	3.1	8	$X^2 = 1.10$	0.05
Save money	3.3	14	7.0	11	1.1	3	$X^2 = 10.39$**	0.05
Reduce waste	2.9	12	5.1	8	1.5	4	**$X^2 = 4.46$***	0.16**
More flexibility	2.2	9	2.5	4	1.9	5	**$X^2 = 0.19$**	0.07
Increase job satisfaction	1.9	8	1.9	3	1.9	5	**$X^2 = 0.00$**	0.09
Disadvantages of adopting LBs								
Time required	7.2	30	9.6	15	5.7	15	$X^2 = 2.13$	0.04
People resistance	6.2	26	9.6	15	4.2	11	$X^2 = 4.79$*	0.12*
Work required	3.8	16	5.1	8	3.1	8	$X^2 = 1.10$	0.06
Potential job losses	3.1	13	1.9	3	3.8	10	**$X^2 = 1.20$**	0.01
Needing to change	2.9	12	3.8	6	2.3	6	**$X^2 = 0.82$**	0.04

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

[61] Chi square results in bold should be treated with caution as they contained one or more cells with expected counts less than 5 (Field, 2000).

The most common advantages the whole sample mentioned were related to, in descending order, greater efficiency and effectiveness (18.2%, n = 76), saving time/better time management (10%, n = 42) and improving/streamlining procedures (6.9%, n = 29). The most commonly mentioned disadvantages were related to time requirements (7.2%, n = 30) and people resistance (6.2%, n = 26) (see Table 7.6).

A series of Chi square tests were conducted to determine any significant differences between intenders and non-intenders. Intenders were significantly more likely than non-intenders to mention as an advantage greater efficiency and effectiveness (X^2 = 16.38, df = 1, $p < 0.001$), saving money (X^2 = 10.39, df = 1, $p < 0.01$), saving time/better time management (X^2 = 5.89, df = 1, $p < 0.05$) and reducing waste (X^2 = 4.46, df = 1, $p < 0.05$), and to mention as a disadvantage people resistance (X^2 = 4.79, df = 1, $p < 0.05$). No other statistically significant differences between intenders and non-intenders were found.

7.4.5.2. Direct Attitude and Behavioural Beliefs

The final column in Table 7.6 shows the point-biserial correlations between each of the beliefs and direct attitude. Employees were significantly more likely to have an overall positive attitude towards adopting LBs if they mentioned as an advantage of their doing so greater efficiency and effectiveness (r = 0.29, $p < 0.001$), reduced waste (r = 0.16, $p < 0.01$) and improved performance/productivity (r = 0.13, $p <$ 0.01), or mentioned people resistance as a disadvantage (r = 0.12, $p < 0.05$).

Direct attitude was regressed onto the ten advantages and five disadvantages. Together they explained a statistically significant 13% of the variance in attitude ($F_{\text{change } 15, 398}$ = 3.97, $p < 0.001$). Employees were significantly more likely to have a positive attitude towards adopting LBs if they mentioned greater efficiency and effectiveness and reduced waste as advantages (see Table 7.7).

Table 7.7: Regression Analysis of Beliefs onto Attitude

Predictor	R^2	F	β
Greater efficiency and effectiveness	0.13	3.97	0.26***
Saving time/better time management			0.05
Improve/streamline procedures			0.04
Improve performance/productivity			0.09
Less bureaucracy/red tape			0.03
Less duplication			0.03
Save money			-0.01
Reduce waste			0.12*
More flexibility			0.07
Increase job satisfaction			0.02
Time required			-0.04
People resistance			0.04
Work required			0.04
Potential job losses			-0.06
Needing to change			0.03

*** $p < 0.001$, * $p < 0.05$

7.4.5.3. Normative Beliefs

The means and standard deviations of intenders and non-intenders for normative belief (NB), motivation to comply (MC), NB*MC, and PBC data are reported in Table 7.8.

A series of Kolmogorov-Smirnov tests suggested that all of the variables listed in Table 7.8 were significantly abnormally distributed. Following Field's (2000) recommendations concerning the use of Kolmogorov-Smirnov tests with large samples, histograms, distribution plots and skewness and kurtosis values were also analysed. These analyses suggested that all the variables were reasonably normally distributed except for the variables with means highlighted in bold, all of which had

skewness and/or kurtosis values less than -1 or greater than 1. To determine any significant differences between intenders and non-intenders, independent t tests were conducted on the normally distributed variables and Mann Whitney U tests were conducted on the abnormally distributed variables. The results are reported in Table 7.8.

Significant differences were found for all the multiplicative measures of normative beliefs by motivation to comply. Unlike non-intenders, intenders on average believed that most people important to them (t = -8.40, df = 416, $p < 0.001$), their co-workers (t = -9.20, df = 416, $p < 0.001$) and their manager/supervisor (t = -9.77, df = 319.87, $p < 0.001$) would approve of their adoption of LBs. Intenders were significantly more likely than non-intenders to be motivated to comply with people important to them (U = 16118.50, $p < 0.001$), with co-workers, (U = 16733.00, $p < 0.001$) and with their manager/supervisor (U = 15836.50, $p < 0.001$).

7.4.5.4. PBC Items

Unlike non-intenders, intenders generally perceived that they could control whether they adopted LBs. Significant differences between intenders and non-intenders were noted for each of the PBC items ("Adopting LBs is easy for me to do", t = -13.01, df = 398.78, $p < 0.001$; "I feel confident that I can adopt LBs", t = -15.15, df = 409.76, $p < 0.001$; "If I wanted to, I could easily adopt LBs", t = -13.20, df = 404.68, $p < 0.001$; "There are few barriers to my adopting LBs", t = -8.04, df = 416, $p < 0.001$; "I can control whether I decide to adopt LBs", t = -9.39, df = 416, $p < 0.001$).

Table 7.8: Percentages Reporting Beliefs and Differences between Non-intenders and Intenders

Salient referents	% with belief	Normative Beliefs (NB)					Motivation to Comply (MC)					NB*MC				
		Non-intenders		Intenders			Non-intenders		Intenders			Non-intenders		Intenders		
		M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Most people important to me	25.2	-0.45	1.30	0.66	1.33	***	**5.41**	1.34	**5.89**	1.07	***	-2.06	7.23	4.37	7.89	***
Co-workers	24.6	-0.53	1.29	0.68	1.33	***	**5.32**	1.30	**5.75**	0.97	***	-2.54	7.14	4.25	7.64	***
Manager/supervisor	37.4	-0.25	1.37	1.13	1.42	***	**5.50**	1.40	**6.04**	1.06	***	-0.87	7.59	7.15	8.80	***

PBC Items	% with belief	Non-intenders		Intenders		
		M	SD	M	SD	
Adopting LBs at CU in the next 6 months is easy for me to do	48.1	-0.19	1.55	1.54	1.15	***
I feel confident that I can adopt LBs at CU in the next 6 months	52.0	-0.16	1.53	1.75	1.04	***
If I wanted to, I could easily adopt LBs at CU in the next 6 months	52.1	-0.11	1.61	1.68	1.15	***
There are few barriers to my adopting LBs at CU in the next 6 months	40.4	-0.28	1.50	0.96	1.57	***
I can control whether I decide to adopt LBs at CU in the next 6 months	37.6	-0.45	1.53	1.02	1.58	***

*** $p < 0.001$; M = mean, SD = standard deviation. Means in bold represent abnormally distributed data and where Mann Whitney U tests were used to detect any significant differences.

7.5. Summary of Results

Attitude, subjective norm and PBC were each significant independent predictors of intentions and together explained 66.9% of the variance in intentions. The non-TPB variables did not predict intentions independently of the TPB variables. Intentions and PBC each had significant positive correlations with Time 2 behaviour but were not significant independent predictors of behaviour when entered into a regression model with the non-TPB variables significantly correlated with behaviour. Job satisfaction, organisational commitment, past behaviour, LSE and employee level all had significant effects on Time 2 behaviour independently of the TPB variables.

Chapter 8: Cross-sample Comparisons and Discussion

8.1. Introduction

A substantial amount of individual-level data has been collected from employees in four organisations in the early stages of their Lean implementations. Thus far, the results have been analysed for each of the samples separately. The purpose of the present chapter is two-fold; to compare the results obtained from the different samples to determine the extent to which there is general support for the hypotheses and to establish any commonalties or discrepancies in the findings; and to discuss the results and to relate where possible the findings to previous literature and research[62]. A summary of the findings in relation to the five research questions and the conclusions will be discussed in the next chapter.

8.2. Hypothesis Testing

Table 8.1 lists the hypotheses and summarises whether they were supported with each of the samples. The final column details the conclusions concerning whether the hypotheses were supported overall. This section will discuss the rationale behind those conclusions. To avoid unnecessary repetition, discussion of the overall conclusions relating to the hypotheses will be provided later in this Chapter when the overall results from the other analyses are presented.

The Rizla, Ivax and CU results support the prediction that intentions to adopt LBs would be significantly and positively correlated with attitudes and subjective norms. Although the Arvin results revealed a fairly strong positive correlation between intentions and attitudes (r = 0.32, p = 0.11[63]) and a moderate positive correlation between intentions and subjective norms (r = 0.22, p = 0.29), these correlations fell short of statistical significance. Significant results are less likely to emerge with small sample sizes (Baron & Kenny, 1986) and the sample size at Arvin was small (n = 27). It is concluded that ***hypotheses 1*** and ***2*** are supported overall and that the more

[62] Because the results from each organisation have already been reported in Chapters 4-7 and to avoid unnecessary repetition, the cross-sample comparisons and discussion sections are combined into one chapter.

[63] Recall that p values < 0.05 are regarded as statistically significant.

positive are employees' attitudes towards adopting LBs or the more positive are their subjective norms in relation to adopting LBs, the stronger are their intentions to adopt LBs. There was universal support for ***hypothesis 3*** - the higher were employees' PBC with respect to adopting LBs, the stronger were their intentions to adopt LBs.

Although the CU results suggested that intentions and employee engagement in LBs at Time 2 were positively related, the corresponding correlation at Ivax fell short of statistical significance ($r = 0.17, p = 0.16$) and the Arvin results revealed a very weak negative relationship between these two variables ($r = -0.09$, $p = 0.73$). There is insufficient support for ***hypothesis 4***.

The CU results suggested a direct relationship between PBC and Time 2 behaviour independent of intentions. However, PBC was not significantly correlated with Time 2 behaviour among Ivax respondents ($r = 0.14$, $p = 0.27$) and PBC and Time 2 behaviour were virtually unrelated among Arvin respondents ($r = 0.03$, $p = 0.91$). Considering these results together, ***hypothesis 5*** is rejected.

As shown in Table 8.1, there are a number of instances where a hypothesis is only supported with the Ivax and CU samples. Because of their relatively large sample sizes, greater weight will be placed on the Ivax and CU results. It is concluded that attitude partially mediates the positive relationship between job satisfaction and intentions (partial support for ***hypothesis 6***); attitude partially mediates the positive relationship between organisational commitment and intentions (partial support for ***hypothesis 7***); the positive LSE-intentions relationship is partially mediated by PBC (support for ***hypothesis 8***) and partially mediated by attitude (support for ***hypothesis 9***); managers reported a more positive attitude towards adopting LBs than non-managers (support for ***hypothesis 19***); and the more employees engaged in LBs in the past, the stronger their intentions (support for ***hypothesis 10***), the more positive their attitudes (support for ***hypothesis 11***), the more positive their subjective norms (support for ***hypothesis 12***) and the greater their engagement in LBs at Time 2 (support for ***hypothesis 14***).

Table 8.1: Summary of Hypotheses and Cross-sample Results

	Hypotheses	Rizla	Ivax	Arvin	CU	Overall
H1	The more positive are employees' attitudes towards their adopting of LBs, the stronger will be their intentions to engage in LBs	√	√	X	√	√
H2	The more positive are employees' subjective norms to adopt LBs, the stronger will be their intentions to engage in LBs	√	√	X	√	√
H3	The higher are employees' PBC with respect to adopting LBs, the stronger will be their intentions to engage in LBs	√	√	√	√	√
H4	Intentions and future employee engagement in LBs will be positively related	NA	X	X	√	X
H5	PBC will have a direct relationship with future engagement in LBs independent of intentions	NA	X	X	√	X
H6	Attitudes to adopting LBs will mediate the positive relationship between job satisfaction and intentions to adopt LBs	X	√ Partial mediator	X	√ Partial mediator	√ Partial mediator
H7	Attitudes to adopting LBs will mediate the positive relationship between organisational commitment and intentions to adopt LBs	X	√ Partial mediator	X	√ Partial mediator	√ Partial mediator
H8	PBC will partially mediate the positive relationship between LSE and intentions to adopt LBs	X	√	X	√	√
H9	Attitude will partially mediate the positive relationship between LSE and intentions to adopt LBs	X	√	X	√	√
H10	The more that employees have engaged in LBs in the past, the stronger will be their intentions to adopt LBs	X	√	X	√	√
H11	The more that employees have engaged in LBs in the past, the more positive will be their attitudes towards adopting LBs	X	√	X	√	√
H12	The more that employees have engaged in LBs in the past, the more positive will be their subjective norms to adopt LBs	X	√	X	√	√
H13	The more that employees have engaged in LBs in the past, the greater will be their PBC with respect to adopting LBs	X	X	X	√	X
H14	The more that employees have engaged in LBs in the past, the greater will be their future engagement in LBs	NA	√	X	√	√
H15	The more that employees have engaged in LBs in the past, the greater will be their LSE	√	√	√	√	√
H16	Union members will have a more negative attitude towards their adoption of LBs than non-union members	X	√	X	X	X
H17	Organisational tenure and attitude to adopting LBs will be negatively related	X	X	X	X	X
H18	Managers will report greater past engagement in LBs than non-managers	√	√	NA	√	√
H19	Managers will report a more positive attitude towards their adoption of LBs than non-managers	X	√	NA	√	√
H20	Openness and attitude towards adopting LBs will be positively related	X	√	X	NA	√
H21	Conscientiousness and attitude towards adopting LBs will be positively related	X	√	X	NA	√
H22	Extraversion and attitude towards adopting LBs will be positively related	X	√	√	NA	√
H23	Agreeableness and attitude towards adopting LBs will be positively related	X	√	X	NA	X
H24	Neuroticism and attitude towards adopting LBs will be negatively related	X	√	X	NA	√
H25	LSE will be positively correlated with openness	√	√	√	NA	√
H26	LSE will be positively correlated with conscientiousness	√	√	√	NA	√
H27	LSE will be positively correlated with extraversion	√	√	X	NA	√
H28	LSE will be positively correlated with agreeableness	X	√	X	NA	√
H29	LSE will be negatively correlated with neuroticism	√	√	X	NA	√
H30	Females will report a more positive attitude towards their adoption of LBs than males	X	X	NA	√	X
H31	Age and attitude to adopting LBs will be negatively related	X	X	X	X	X

The Rizla, Ivax and Arvin results failed to provide support for the prediction that the more employees engaged in LBs in the past, the greater would be their PBC with respect to adopting LBs. Hence ***hypothesis 13*** is rejected.

A positive correlation between past engagement in LBs and LSE was found with each of the samples, providing universal support for ***hypothesis 15***.

The Rizla, Arvin and CU samples failed to provide support for the prediction that union members would have a more negative attitude towards their adoption of LBs than non-union members. ***Hypothesis 16*** is rejected.

There was no support for the proposition that organisational tenure and attitude to adopting LBs would be negatively related. ***Hypothesis 17*** is rejected.

There was universal support for ***hypothesis 18***, namely that managers would report greater past engagement in LBs than non-managers.

Personality data was not collected from the CU sample. Conclusions relating to ***hypotheses 20*** to ***29*** are therefore based only on the Rizla, Ivax and Arvin results. When analysing the personality-attitude data, it is useful to consider the size of the correlations across the three samples (see Table 8.2). Although the positive correlation between attitude and openness failed to achieve statistical significance in the Rizla or Arvin samples, the Rizla correlation (r = 0.25) is larger than the significant Ivax correlation (r = 0.21) and the Arvin correlation (r = 0.19) is almost the same size as the Ivax correlation. The small sample sizes at Rizla and Arvin could explain why these correlations failed to reach statistical significance. Bearing all this in mind, it is concluded that there is a positive relationship between openness and attitude towards adopting LBs and ***hypothesis 20*** is supported.

The non-significant conscientiousness-attitude correlations at Rizla (r = 0.29) and Arvin (r = 0.25) are larger than the significant conscientiousness-attitude correlation at Ivax (r = 0.23). Similarly, the non-significant neuroticism-attitude correlations at Rizla (r = -0.14) and Arvin (r = -0.20) are larger than the significant neuroticism-attitude correlation at Ivax (r = -0.12). Based on these findings and bearing in mind

the comparatively small sample sizes at Rizla and Arvin, it is concluded that attitude towards adopting LBs is positively related to conscientiousness and negatively related to neuroticism. ***Hypothesis 21*** and ***hypothesis 24*** are supported.

Table 8.2: Cross-sample Comparisons of Personality-attitude Correlations

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Rizla	0.25	0.29	0.20	0.06	-0.14
Ivax	0.21***	0.23***	0.14*	0.20***	-0.12*
Arvin	0.19	0.25	0.46*	-0.03	-0.20

*** $p < 0.001$, * $p < 0.05$

The Ivax and Arvin results suggested a significant positive extraversion-attitude correlation. The non-significant extraversion-attitude correlation at Rizla (r = 0.20) was higher than the significant correlation at Ivax (r = 0.14). Overall, these results suggest that extraversion and attitude towards adopting LBs are positively related and ***hypothesis 22*** is supported.

The Ivax results suggested a significant positive agreeableness-attitude correlation (r = 0.20) yet the corresponding correlations at Rizla and Arvin were virtually zero (r = 0.06 and r = -0.03, respectively). ***Hypothesis 23*** is rejected.

There was universal support for the prediction that LSE would be positively correlated with openness (***hypothesis 25***) and conscientiousness (***hypothesis 26***). With the Rizla and Ivax samples, LSE was positively correlated with extraversion, and the corresponding Arvin correlation was moderate (r = 0.19). It is concluded that LSE and extraversion are positively correlated (***hypothesis 27***). Although the Ivax results suggested a significant positive correlation between LSE and agreeableness (r = 0.17), the correlations for Rizla (r = 0.15) and Arvin (r = 0.15) fell short of statistical significance. They were, however, of similar magnitude to the Ivax

correlation. Bearing in mind the small sample sizes at Rizla and Arvin, it is concluded that LSE is positively correlated with agreeableness (***hypothesis 28***). The Rizla and Ivax results suggested that LSE and neuroticism were significantly negatively related. The Arvin correlation, although non-significant, was still moderately high (r = -0.31). It is concluded that LSE is negatively correlated with neuroticism (***hypothesis 29***).

Only the CU sample provided support for the prediction that females would report a more positive attitude towards their adoption of LBs than males and hence ***hypothesis 30*** is rejected overall.

No support was found for the prediction that age and attitude to adopting LBs would be negatively related. ***Hypothesis 31*** is rejected.

8.3. Predictors of Intentions and Time 2 Behaviour

Table 8.3 summarises by sample the correlations intentions and Time 2 behaviour have with each of the variables measured in the study, and the weighted cross-sample mean correlations. The weighted means (i.e., weighting each correlation by the number of people in each sample) rather than the simple means were calculated because weighted analyses tend to produce more accurate results (Hunter & Schmidt, 1990). The correlations were not transformed to Fisher z form because it has been argued that this produces an estimate of the average correlation that is upwardly biased and less accurate than analyses using untransformed correlations (Field, 2001; Hall & Brannick, 2002; Hunter & Schmidt, 1990).

Table 8.3: Cross-sample Correlation Analysis[64]

	Intentions					Time 2 Behaviour			
	Rizla (n = 42)	Ivax (n = 331)	Arvin (n = 27)	CU (n = 418)	Weighted Mean (n = 818)	Ivax (n = 72)	Arvin (n = 19)	CU (n = 121)	Weighted Mean (n = 212)
Intentions	1	1	1	1	1	0.17	-0.09	0.32***	0.23
Direct Attitude	0.35*	0.51***	0.32	0.48***	0.48	-0.03	0.06	0.27**	0.15
Indirect Attitude	0.22	0.40***	0.41*	/	0.38	0.20	-0.06	/	0.15
Subjective Norm	0.42**	0.51***	0.22	0.55***	0.52	0.16	0.05	0.29***	0.22
PBC	0.49***	0.60***	0.60**	0.75***	0.67	0.14	0.03	0.36***	0.26
Job satisfaction	-0.15	0.21***	-0.06	0.23***	0.19	0.09	0.34	0.47***	0.33
Organisational commitment	-0.05	0.34***	0.05	0.21***	0.24	0.16	0.33	0.28**	0.24
Past behaviour	-0.19	0.17**	-0.27	0.28***	0.19	0.39***	0.39	0.86***	0.66
LSE	0.14	0.19***	-0.11	0.20***	0.18	0.29*	0.18	0.54***	0.42
Conscientiousness	0.29	0.16**	-0.01	/	0.16	0.08	0.10	/	0.08
Agreeableness	0.15	0.17**	-0.15	/	0.15	0.19	-0.36	/	0.08
Openness	0.14	0.18**	-0.12	/	0.16	0.20	0.12	/	0.18
Extraversion	0.11	0.13*	0.19	/	0.13	0.13	0.16	/	0.14
Neuroticism	-0.03	-0.10	0.09	/	-0.08	-0.31*	0.05	/	-0.23
Organisational tenure (years)	0.09	-0.03	-0.10	0.07	0.02	-0.04	0.09	-0.08	-0.05
Employee level	-0.12	0.12	/	0.18**	0.14	0.48***	/	0.60***	0.56
Union membership	0.17	-0.06	0.07	0.04	0.01	-0.34**	-0.25	0.03	-0.12
Gender	0.31	0.07	/	0.13**	0.11	0.14	/	-0.01	0.05
Age	-0.21	-0.04	-0.23	-0.04	-0.06	0.04	0.01	0.03	0.03

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Employee level (non-managers = 0, managers = 1), union membership (non-union members = 0, union members = 1), gender (male = 1, female = 2), and age (16-25 years = 1, 26-35 years = 2, 36-45 years = 3, 46-55 years = 4, 56-65 years = 5, and for the CU sample, >65 years = 6) were all represented by dummy variables.

[64] Recall that Time 2 behaviour data was not collected from Rizla; hence the absence of this data.

The top half of Table 8.4 summarises as a function of sample the percentage of variance in intentions explained by attitude, subjective norm and PBC, and the regression results when intentions are the dependent variable and the TPB predictors are the independent variables[65]. The bottom half of Table 8.4 summarises the results when Time 2 behaviour is the dependent variable and the TPB variables, past behaviour, employee level and LSE are entered as independent variables[66]. Only these non-TPB variables were included because they were the only non-TPB variables significantly correlated with Time 2 behaviour for both the Ivax and CU samples.

Table 8.4: Cross-sample Beta-weights and Explained Variance in Intentions and Time 2 Behaviour

		Rizla	Ivax	Arvin	CU
Intentions	Attitude	0.16	0.27***	0.08	0.22***
	Subjective norm	0.06	0.24***	-0.04	0.22***
	PBC	0.44*	0.41***	0.58**	0.59***
	% variance in intentions explained by attitude, subjective norm and PBC	32%	50.4%	36.4%	66.9%
Time 2 Behaviour[67]	Intentions	/	0.08	/	0.12
	PBC	/	0.00	/	-0.05
	Attitude	/	-0.23	/	-0.08
	Subjective norm	/	0.03	/	0.04
	Past behaviour	/	0.18	/	0.67***
	Employee level	/	0.35*	/	0.19**
	LSE	/	0.10	/	0.10
	% variance in Time 2 behaviour explained by intentions and PBC	/	3.3%	/	13.4%

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

[65] The beta weights are taken from Tables 4.5, 5.4, 6.4 and 7.4.
[66] The beta weights are taken from the final steps in the hierarchical regressions reported in Tables 5.6 and 7.5.
[67] With the Arvin sample, a regression with Time 2 behaviour as the dependent variable was not conducted because behaviour was not significantly correlated with any of the TPB or non-TPB variables (see Section 6.4.2.6); hence the empty cells in this table.

8.3.1. Predictors of Intentions

Across all four samples, PBC was the only variable to be significantly and positively correlated with intentions and, of all the variables measured, had the highest weighted mean correlation with intentions (r = 0.67). Based on the regression analyses, PBC was also the only TPB variable to be a significant independent predictor of intentions in all four samples, which highlights the importance of the PBC construct in predicting employee intentions to adopt LBs. Subjective norm and direct attitude were positively correlated with intentions in all four samples, generating mean correlations of 0.52 and 0.48 respectively, and were significant for the Rizla, Ivax and CU samples. Cohen (1992) offers a useful guide to interpreting the magnitude of effect sizes. Correlations of 0.10 represent small effect sizes, correlations of 0.30, medium effect sizes and correlations of 0.50, large effect sizes. Using this guide, each of the TPB predictors had a large effect on intentions[68].

Across all four samples, none of the non-TPB variables was a significant independent predictor of employee intentions after taking account of the TPB predictors. Although job satisfaction, organisational commitment, past behaviour and LSE were significantly and positively correlated with intentions in the Ivax and CU samples, these variables were not significant independent predictors of intentions when the TPB predictors were entered into the regression equations. Further analyses confirmed that attitude partially mediated the job satisfaction-intentions and organisational commitment-intentions relations, and that both attitude and PBC mediated the LSE-intentions relation. The Ivax and CU results revealed that past behaviour had a virtually zero beta with intentions when the TPB predictors were entered. The Ivax results showed a significant positive correlation between intentions and conscientiousness, agreeableness, openness and extraversion, and the CU results suggested that managers and females were significantly more likely to report intentions to adopt LBs than non-managers and males. However, regression analyses indicated that the effects of these non-TPB variables on intentions were often close to zero when the TPB variables were entered into the analyses. These findings are in accordance with Ajzen (1991) who argues that attitudes, subjective norms and PBC

[68] Cohen's (1992) guide to interpreting the magnitude of effect sizes will be used in the reminder of the thesis.

should be the only significant independent predictors of intentions, and that the influence of non-TPB variables on intentions should be indirect in that their effects are mediated by the TPB predictors.

Armitage and Conner's (2001a) meta-analysis showed that intentions had the strongest correlation with attitude (r = 0.49) followed by PBC (r = 0.43) and subjective norm (r = 0.34). Although the relative strength of the TPB predictors in the current study differs from Armitage and Conner's findings, this is not unusual because "the relative importance of attitude, subjective norm, and PBC in the prediction of intentions is expected to vary across behaviours and situations" (Ajzen, 1991, p. 188).

The mean attitude-intentions correlation in the current study (r = 0.48) compares favourably with Armitage and Conner's (2001a) (r = 0.49) and suggests that a more positive attitude towards adopting LBs is associated with greater intentions to adopt LBs. In their study into the application of the TPB to employee intentions to support an employee involvement programme, Dawkins and Frass (2005) found a significant positive attitude-intentions relation (r = 0.36, p < 0.01). The slightly smaller correlation found by Dawkins and Frass may be due to their use of an indirect attitude measure. The 0.48 reported in the current study is based on the direct attitude-intentions correlation. Direct attitude measures are usually more powerful predictors of intentions than belief-based measures because they are more likely to capture spontaneous, highly accessible appraisals (Ajzen, 1991; Manstead & Parker, 1995). The indirect attitude-intentions correlation in the current study (r = 0.38) compares favourably with Dawkins and Frass' findings.

The mean PBC-intentions correlation found in the current study (r = 0.67) was considerably larger than that reported by Dawkins and Frass (2005) (r = 0.32, p < 0.01) and Armitage and Conner (2001a) (r = 0.43). This finding may simply reflect the overwhelming importance PBC plays in predicting employee intentions to adopt LBs. Indeed the fact that PBC was a significant independent predictor of intentions with all four samples irrespective of the small Rizla and Arvin samples suggests the importance of the PBC construct.

As discussed in Section 2.5.1.1, PBC constitutes the beliefs about how easy or difficult it would be to perform the behaviour, and "the addition of PBC should become increasingly useful as volitional control over behaviour decreases" (Ajzen, 1991, p. 185). An employee's ability to perform many of the LBs is dependent upon external factors such as co-operation of colleagues and organisational policies and procedures. Job rotation and team-working and, to an extent, maintaining a neat and tidy work area, are highly reliant upon adequate co-operation from colleagues. Appropriate policies and procedures are needed to enable employees to participate in improvement activities and decision-making, to design new ways of working, to target-set, to use a variety of skills/abilities in their job, and to engage in autonomous working. PBC should theoretically be a particularly strong determinant of employee intentions to adopt LBs.

The mean subjective norm-intentions correlation found in the current study ($r = 0.52$) is much larger than that reported by Dawkins and Frass (2005) ($r = 0.33$, $p < 0.01$) and Armitage and Conner (2001a) ($r = 0.34$). Some of the LBs (teamworking, job rotation, training colleagues, suggestion-making, contributing to discussions about the organisation's strategy) do have a social element to them and it is therefore not surprising that social influences would play a particularly important role in the context of LBs. Furthermore, an employee's ability to perform several of the LBs would, to an extent, depend upon the co-operation of colleagues and the support of managers to introduce polices and procedures that reinforce LBs.

Although subjective norms have been criticised for being weak predictors of intentions (Godin & Kok, 1996), the current study suggests that they are an important determinant of employee intentions to adopt LBs. Past research has demonstrated positive links between perceived supervisory support and employee receptiveness to TQM practices and quality circles, and employee engagement in proactive, innovative behaviours (Amabile et al., 1996; Crant; 2000; Parker et al., 2006; Scott & Bruce, 1994; Steel & Lloyd, 1988). If decision-makers are limited in their abilities to process information, as bounded rationality models of decision-making would suggest, then employees in dynamic, organisational contexts are likely to use decision-making heuristics such as the perceived support of people they respect when deciding a course of action (Dawkins & Frass, 2005).

Among CU, Ivax, Arvin and Rizla respondents, attitude, subjective norm and PBC explained 66.9%, 50.4%, 36.4% and 32% of the variance in intentions, respectively. Using Hunter and Schmidt's (1990) weighting formula, an average weighted 57.4% of the variance in intentions was explained by the TPB predictors across the four samples. This mean percentage is slightly higher than the 40% to 50% reported in meta-analytic reviews of the TPB (Ajzen, 1991; Armitage & Conner, 2001a; Conner & Armitage, 1998; Godin & Kok, 1996; Sutton, 1998) but presumably reflects the greater influence PBC and subjective norms have over employee intentions to adopt LBs.

8.3.2. Predictors of Time 2 Behaviour

8.3.2.1 Intentions-Time 2 Behaviour Relation

The cross-sample mean correlation between intentions and Time 2 behaviour was 0.23, suggesting that intentions had a small-to-medium effect on Time 2 behaviour. This value is much lower than the large effects reported in meta-analytic reviews of the TPB (r = 0.45, Ajzen, 1991; r = 0.47, Armitage & Conner, 2001a; r = 0.47, Conner & Armitage, 1998; r = 0.48, Conner & Sparks, 2005; r = 0.46, Godin & Kok, 1996; r = 0.47, Hausenblas et al., 1997; r = 0.45, Randall & Wolff, 1994; r = 0.44, Sheeran & Orbell, 1998a) but, as Ajzen (1991) notes, the predictive power of intentions on behaviour does vary across behaviours. The intentions-Time 2 behaviour correlation was very weak but negative at Arvin (r = -0.09) and was small-to-medium at Ivax (r = 0.17). Although intentions had a medium, significant effect on Time 2 behaviour at CU (r = 0.32), the regression results revealed that it was not a significant independent predictor of Time 2 behaviour. Based on Hunter and Schmidt's (1990) weighting formula, intentions independently explained a weighted average of only 7.6% of the variance in Time 2 behaviour across the Ivax and CU samples. There are several potential explanations for the weaker impact of intentions on Time 2 behaviour found in the current study.

Significant results are less likely to emerge with small sample sizes (Baron & Kenny, 1986; Field, 2000) and the relatively small Time 2 sample sizes are a very likely explanation for the absence of significant independent effects of intentions on Time 2

behaviour, particularly among Arvin and Ivax respondents. The fact that the size of the correlations increase relative to the sample sizes lends support to this argument (Arvin, $n = 19$, $r = -0.09$; Ivax, $n = 72$, $r = 0.17$; CU, $n = 121$, $r = 0.32$). Perhaps with larger Time 2 samples, intentions would have emerged as a significant independent predictor of Time 2 behaviour.

According to Ajzen (1991), "behavioural intentions can find expression in behaviour only if the behaviour in question is under volitional control, i.e., if the person can decide at will to perform or not perform the behaviour" (p. 181 to p. 182). As discussed in Section 8.3.1, an employee's ability to perform many of the LBs depends, to an extent, upon external factors such as co-operation of colleagues and organisational policies and procedures. The fact that engagement in LBs is not under complete volitional control could explain why the intentions-Time 2 behaviour correlations were not larger.

The importance of stable behavioural intentions for predicting behaviour is recognised as a principle limitation of the TPB (Ajzen, 2002; Cooke & Sheeran, 2004; Sheeran & Abraham, 2003; Sutton, 1998). For maximum prediction, intentions and behaviour should be measured as close as possible in time because the longer the time interval between the measurement of intentions and behaviour, the greater the likelihood that events will occur that may change intentions (Ajzen, 1991; Ajzen & Fishbein, 1980). A meta-analysis by Sheeran and Orbell (1998a) supports this argument. Significantly stronger intentions-behaviour correlations were associated with shorter time intervals. For reasons discussed in Section 3.5, the time period between measuring intentions and behaviour in the current study was 6 months at Arvin and CU and, as discussed in Section 5.3, 11 months at Ivax. During this intervening period, employee intentions to adopt LBs may have changed.

Indeed there is reason to believe that Ivax employee intentions are likely to have become more positive during the inter-questionnaire period. Prior to the introduction of Lean in early 2006, Ivax had assumed a Continuous Improvement (CI) approach to the business. Discussions with employees during the interviews/focus groups and with the CI Director and the HR Director suggested that, under CI, employees were generally not afforded sufficient time to complete CI projects and CI was not fully

integrated into everyday working life. This could have dampened employees' enthusiasm for an improvement initiative such as Lean, leading employees to report weaker intentions to adopt LBs at Time 1. There was also a general feeling of insecurity and scepticism among staff due to the recent merger with Teva, and some employees may have believed that the overwhelming pressures placed on the business to reduce costs would lead to job losses. These factors could also have weakened intentions. However, during the inter-questionnaire period, employees across the site witnessed large increases in production, which the CI Director believed created tremendous confidence and buoyancy among staff. Teva were also providing Ivax with more information about targets and company strategy, information that was fed down to employees and enabled them to understand the longer-term vision for the site. Several improvement projects were initiated which allowed employees to apply Lean principles to their own work areas and afforded them greater opportunities for developing skills in decision-making, problem-solving and suggestion-making. In the words of the HR Director, "2006 was the theory, 2007 was translating that theory into Lean practice". These events are likely to have enhanced employee's intentions and willingness to adopt LBs and could partly explain why the Ivax intentions-Time 2 behaviour correlation was not larger.

Based on discussions with the Engineering Director at Arvin, the intentions of the engineers to adopt LBs are also likely to have increased during the inter-questionnaire period. The pre-questionnaire interviews and discussions with the Engineering Director suggested that, prior to the first questionnaire, the engineers generally lacked information about Lean and how it could affect them. This could have caused them to report moderately weak intentions to adopt LBs. However, during the inter-questionnaire period, many changes took place within the engineering department. All the engineers were provided with some problem-solving training and with a background to Lean and how it could improve their working life; a resource review system was introduced which enabled the engineers to forward plan their work and encouraged job rotations; the engineers were able to offer suggestions for a new time measurement system to be introduced; visual management was implemented; and some of the engineers become chartered which, according to the Engineering Director, encouraged greater employee focus on quality. These events could have contributed to enhancing the intentions of the engineers to

adopt LBs prior to the second questionnaire and could partly explain the absence of a positive intentions-Time 2 behaviour correlation at Arvin.

During the inter-questionnaire period at CU, several Lean awareness sessions had taken place across the University and a few employees were involved in some Lean improvement projects. These events touched only a handful of staff (under 5% according to the LU team) and no other Lean communication or training was delivered during this period. The intentions of CU respondents overall are unlikely to have changed dramatically during the inter-questionnaire period. This could partly explain why the intentions-Time 2 behaviour correlation was considerably larger at CU than at Ivax and Arvin.

One way to maximise intentions-behaviour correlations is to match the measures as closely as possible (Ajzen, 1988; Sutton, 1998), for example, *"I intend to adopt LBs at this organisation in the next six months"* (intentions) and *"I have adopted LBs at this organisation in the past six months"* (behaviour). In the present research, instead of using one item to measure Time 2 behaviour, respondents were asked to report the extent to which they had engaged in each of 20 LBs at their organisation in the past 6 months (or 11 months in the case of Ivax), and overall engagement in LBs reflected the mean across these 20 behaviours. It was felt that this measure would capture more fully the true extent of employee engagement in the full range of LBs. However, employing a Time 2 behaviour measure with less direct compatibility with the intentions measure may have weakened the intentions-Time 2 behaviour correlations.

Scale correspondence can enhance correlations (Ajzen & Fishbein, 1980; Sutton, 1998). Intentions were measured on a -3 (extremely unlikely) to 3 (extremely likely) scale and behaviour was measured on a 0 (not at all) to 4 (a great deal) scale. Lack of scale correspondence may also have contributed to weaker intentions-Time 2 behaviour correlations.

Ajzen and Fishbein's (1980) *principle of compatibility* states that, for maximum predictive power, the predictor (intentions) and the criterion (behaviour) should be measured at the same level of specificity in relation to action, target, time and context. Although efforts were made to meet these compatibility requirements, for

reasons beyond the researcher's control (see Section 5.3), the Time 2 Ivax questionnaire had to be administered 11 months after the Time 1 questionnaire, despite the specification of a 6-month timeframe at Time 1. This may also have contributed to a weaker intentions-Time 2 behaviour correlation at Ivax. Ajzen and Fishbein's (1980) compatibility requirements could be fully met with the larger CU sample, which could help to explain the comparatively larger CU intentions-Time 2 behaviour correlation.

Webb and Sheeran (2006) argue that studies with large effect sizes may have an increased chance of publication compared to studies that find small or non-significant effect sizes, a phenomenon known as the "file drawer problem" (Rosenthal, 1979). Perhaps the intentions-behaviour correlations reported in various meta-analytic reviews of the TPB are over-estimations of the true correlations and intentions actually have much weaker effects on behaviour.

8.3.2.2 PBC-Time 2 Behaviour Relation

According to the TPB, behaviour can be influenced by PBC as well as intentions, and the influence of PBC on behaviour is particularly important when volitional control is compromised by external factors such as cooperation of others and opportunities. As discussed in Section 8.3.1, an employee's ability to perform many of the LBs is partly dependent upon non-motivational factors such as co-operation of colleagues and organisational policies and procedures. Theoretically PBC should influence employee engagement in LBs. When PBC equates to actual control, it should accurately predict behaviour; but when perceptions of control are unrealistic, it will add little to the prediction of behaviour (Ajzen, 1991; Ajzen & Madden, 1986). An individual needs sufficient direct or indirect experience of the behaviour to have a realistic perception of control. The mean past behaviour scores for each of the samples suggested that employees had direct experience of adopting LBs at Time 1 and hence they should have been able to make realistic, accurate judgements regarding their future ability to adopt LBs. Based on these arguments, PBC would be expected to emerge as a strong direct predictor of Time 2 behaviour.

PBC and Time 2 behaviour were unrelated at Arvin (r = 0.03), and PBC had only a small effect on Time 2 behaviour at Ivax (r = 0.14). Although PBC had a medium significant effect on Time 2 behaviour at CU (r = 0.36), the regression results failed to reveal the significant independent effects of PBC. Across the three samples, the weighted mean PBC-Time 2 behaviour correlation was 0.26, a value lower than Armitage and Conner's (2001a) 0.37. Based on Hunter and Schmidt's (1990) weighting formula, PBC independently explained a weighted average of only 9.2% of the variance in Time 2 behaviour across the Ivax and CU samples. Although the ability of PBC to predict behaviour does vary across situations, behaviours and populations (Ajzen, 1991; Ajzen & Fishbein, 2004), PBC was not as strong a determinant of Time 2 behaviour as expected.

The most likely explanation for this finding is the moderately small Time 2 sample sizes. The size of the PBC-Time 2 behaviour correlations increase relative to the sample sizes, adding weight to this argument (Arvin, n = 19, r = 0.03; Ivax, n = 72, r = 0.14; CU, n = 121, r = 0.36). It is worth noting that the CU PBC-Time 2 behaviour correlation was highly significant ($p < 0.001$) and was close in magnitude to the 0.37 reported by Armitage and Conner (2001a); step 1 of the CU regression analyses showed that PBC was almost a significant independent predictor of Time 2 behaviour (β = 0.30, p = 0.09); and the CU analyses showed PBC to directly influence Time 2 behaviour independent of intentions. Arguably, with larger Time 2 samples, PBC would have emerged as a significant independent predictor of Time 2 behaviour.

PBC was measured using a scale ranging from -3 (*extremely unlikely*) to 3 (*extremely likely*), and Time 2 behaviour was measured using a 0 (*not at all*) to 4 (*a great deal*) scale. Lack of correspondence between these scales may have weakened the PBC-Time 2 behaviour correlations (Ajzen & Fishbein, 1980; Sutton, 1998). The fact that, for reasons beyond the researcher's control, the Time 2 Ivax questionnaire had to be administered 11 months after the Time 1 questionnaire despite a 6-month timeframe being specified at Time 1, thus violating Ajzen and Fishbein's (1980) *principle of compatibility* requirements, could also have contributed to a weaker PBC-Time 2 behaviour correlation at Ivax.

It is possible that Ivax and Arvin employees' PBC changed during the inter-questionnaire period which, according to Ajzen (1991), would have weakened the PBC-Time 2 behaviour correlations. In light of the changes that took place at the Ivax site and particularly the wider opportunities afforded to employees to develop skills in some key LBs, employees' PBC may have increased during the inter-questionnaire period. As discussed in Section 8.3.2.1, a number of changes also took place in Arvin's engineering department during the intervening period, some of which are likely to have enhanced employees' perceptions of their ability to adopt LBs. Because only a few CU employees were exposed to any Lean training and communication during the inter-questionnaire period, the PBC of CU respondents overall is likely to have remained moderately stable, thereby explaining the comparatively larger PBC-Time 2 behaviour correlation at CU.

8.3.2.3. Non-TPB Predictors of Time 2 Behaviour

The results suggest that several non-TPB variables were better predictors of Time 2 behaviour than intentions or PBC. Based on the cross-sample weighted means between Time 2 behaviour and all the TPB and non-TPB variables measured in the study, the strongest correlates with Time 2 behaviour were, in descending order, past behaviour (r = 0.66, the greater the engagement in LBs at Time 1, the greater the engagement in LBs at Time 2), employee level (r = 0.56, managers were more likely to engage in LBs at Time 2 compared to non-managers), and LSE (r = 0.42, the greater the LSE, the greater the engagement in LBs at Time 2). The Ivax and CU regression results revealed that each of these non-TPB variables was a significant predictor of Time 2 behaviour after controlling for the TPB variables. The Arvin results suggested that past behaviour had a medium-to-large effect on Time 2 behaviour and that LSE had a small-to-medium effect[69].

For the Ivax sample, Time 2 behaviour also had a significant negative correlation with union membership and neuroticism – union members or employees scoring higher on neuroticism were significantly less likely to engage in LBs at Time 2 than non-union members or employees scoring lower on neuroticism. Regression analyses

[69] Recall that all Arvin respondents were non-managers; hence it was not possible to asses the impact of employee level on Time 2 behaviour with the Arvin data.

confirmed that union membership and neuroticism were significant negative predictors of Time 2 behaviour after controlling for the TPB variables.

CU Time 2 behaviour was significantly positively correlated with job satisfaction and organisational commitment – the higher employee's job satisfaction or the higher their organisational commitment, the more likely they were to engage in LBs at Time 2. Regression analyses suggested that job satisfaction and organisational commitment were significant positive predictors of Time 2 behaviour after controlling for the TPB variables.

Because none of the TPB or non-TPB variables was a significant predictor of Time 2 behaviour among Arvin respondents, regressions were not conducted. However, agreeableness, job satisfaction, organisational commitment and union membership all had medium effects on Time 2 behaviour. Greater engagement in LBs at Time 2 was associated with lower agreeableness, higher job satisfaction and higher organisational commitment. Union members were less likely to engage in LBs at Time 2 compared to non-union members. The very weak correlations between the TPB constructs and Time 2 behaviour suggests that the relationships each of these variables have with Time 2 behaviour are independent of the TPB variables.

8.3.2.3.1. Past Behaviour-Time 2 Behaviour Relation

The cross-sample weighted mean correlation between past behaviour and Time 2 behaviour was 0.66, a value similar to the 0.68 reported by Conner and Armitage (1998). The effect of past behaviour on Time 2 behaviour was medium-to-large for Ivax and Arvin respondents (r = 0.39 for both samples), and extremely large for CU respondents (r = 0.86). For all three samples, the effect of past behaviour on Time 2 behaviour was independent of the TPB variables (despite past behaviour being significantly correlated with intentions, attitude and subjective norms with the Ivax and CU samples), and past behaviour was a stronger predictor of Time 2 behaviour than intentions or PBC. The direct influence of past behaviour on future behaviour has been widely reported (Albarracin, Johnson, Fishbein & Meuellerleile, 2001; Bagozzi & Kimmel, 1995; Conner & Armitage, 1998; Godin, Valois & Lepage, 1993; Norman & Conner, 1996, 2006; Norman & Smith, 1995; Ouellette & Wood,

1998; Sutton, 1994). The findings do, however, challenge Ajzen's (1991) argument that the impact of past behaviour on future behaviour should be mediated by the TPB variables, PBC in particular because repeated behaviour should enhance perceptions of control. The results actually failed to reveal overall support for a significant positive past behaviour-PBC relation.

Drawing on theories about the multiple processes by which attitudes control behaviour (Bargh, Chaiken, Grovender & Pratto, 1992; Eagly & Chaiken, 1993; Fazio, 1990), Ouellette and Wood (1998) argue that there are two potential routes by which past behaviour can influence future behaviour, one conscious and one non-conscious. Past behavioural enactment may provide people with information that moulds their beliefs about the behaviour, which subsequently determines future behaviour. Based on this 'conscious response' account, the influence of past behaviour would be mediated by the TPB variables.

The 'non-conscious' account of the past-future behaviour relation, which has been supported by research (Aarts, Verplanken, & van Knippenberg, 1998; Bargh, 1990; Bargh & Barndollar, 1996; Ronis, Yates & Kirscht, 1989; Verplanken, 2006; Verplanken & Wood, 2006; Wood & Quinn, 2005; Wood, Quinn & Kashy, 2002), is that behaviours performed repeatedly in stable environments lead to habitual responses in which behaviour is primarily triggered by stimulus/environmental cues (such as time of day or location) and is enacted automatically with minimal effort, attention or conscious intent. Habit formation is the result of the creation of associations in memory between actions and stable features of the circumstances in which they are performed (Verplanken & Wood, 2006). Because habitual responses are triggered by environmental cues, they are immediately available and therefore take priority over alternative, slower responses requiring conscious processing. When behaviour is habitual, simplified decision rules (such as "*I will perform the same behaviour as I have performed in the past*") are more readily used and less cognitive effort is devoted to appraising alternatives (Aarts et al., 1998; Verplanken, Aarts & van Knippenberg, 1997). Under such conditions, socio-cognitive variables such as those in the TPB lose some of their predictive power. When past behaviour has a direct influence on future behaviour over and above the impact of socio-cognitive variables, this usually suggests some involvement of habitual processes that weaken

the impact of intentions on behaviour (Ouellette et al., 1998). Norman and Conner (2006) argue that the performance of repeated, habitual behaviours is less dependent upon rational statements of intentions and controlled processes inherent in the TPB, and more upon past behaviour and automatic processes that characterise habitual responses.

In their meta-analysis of intentions-behaviour and past behaviour–behaviour relations, Ouellette et al. (1998) found that, with behaviours performed infrequently in unstable contexts, intentions were a stronger predictor of behaviour than past behaviour; but with behaviours performed frequently in stable contexts, past behaviour was a stronger predictor of behaviour than intentions. These findings are consistent with Triandis (1977, p. 205), who argues that "when a behavior is new, untried, and unlearned, the behavioral-intentions component will be solely responsible for the behavior ... As behavior repeatedly takes place, habit increases and becomes a better predictor of behavior than behavioral intentions". Aarts et al. (1998) and Verplanken, Aarts, van Knippenberg and Moonen (1998) provide evidence to suggest that intentions are more strongly related to behaviour when habit is weak.

Based on the past behaviour mean scores, many respondents in each of the organisations had been practising LBs a reasonable amount at Time 1. Engagement in LBs could therefore have been fairly habitual to them and future engagement in LBs may have been triggered automatically by relatively stable environmental stimuli (in the form of organisational policies, practices and procedures) that endorse LBs. Past behaviour may also have acted as a source of information to employees in that employees engaged in LBs at Time 2 because they were simply applying the decision rule of behaving as they had done in the past (Conner & Armitage, 1998). The absence of a significant independent effect of intentions on Time 2 behaviour could partly be attributable to the overwhelming influence of employee's habitual past engagement in LBs.

A stable stimulus context is crucial for habitual behaviour to occur (Ajzen, 2002) and Ouellette and Wood (1998) define habit as the tendency to repeat past behaviour in a stable context. As previously noted, few changes had taken place during the inter-

questionnaire period at CU and consequently the organisational context would have remained moderately stable for CU respondents. In contrast, Ivax and Arvin respondents experienced several changes and their organisational contexts would have become less stable. This could partly explain why the past behaviour-Time 2 behaviour correlation at CU (r = 0.86) was considerably larger than that at Ivax or Arvin (r = 0.39 for both samples).

Arguably, the high past behaviour-Time 2 behaviour correlations could partly be attributable to common method variance. The past behaviour and Time 2 behaviour measures were, where possible, worded the same and, unlike the other measures, were measured using the same five-point Likert scale. Predictive power can be increased by using measures with the same form of wording and correspondent scales (Ajzen, 1988, 1991, 2002; Courneya, 1994; Sutton, 1998). Ajzen (1991, 2002) even argues that the impact of past on future behaviour may be over-estimated due to common method variance between self-report measures of past and future behaviour, and Chorlton (2007) provides confirmatory evidence for this. A recent study by Conner, Lawton, Parker, Chorlton, Manstead and Stradling (2007) assessing objective speeding behaviour even showed that the past behaviour-future behaviour relation was attenuated when the measures did not share common method variance. It is worth noting, however, that Conner and Armitage (1998) considered the 13% of the variance in behaviour explained by past behaviour after taking account of intentions and PBC to be too large to be solely attributable to measurement factors and suggested that such a finding could reflect the importance of the past behaviour construct in predicting future behaviour.

8.3.2.3.2. Employee Level-Time 2 Behaviour Relation

Based on the Ivax and CU results, employee level had a large effect on Time 2 behaviour (r = 0.48 and r = 0.60, respectively), suggesting that managers were more likely to report engaging in LBs at Time 2 compared to non-managers. A consistent finding across the Rizla, Ivax and CU samples was that managers reported significantly greater past engagement in LBs than non-managers. This follows the pattern of previous research. LBs such as suggestion-making, problem-solving and decision-making are usually performed by managers (Womack et al., 1990) and,

compared to non-managers, managers are more likely to be members of improvement groups and to generally perceive their jobs to be more autonomous and to involve greater skill and task variety (Axtell & Parker, 2003; Parker, 2000). It is therefore not surprising that respondents occupying managerial roles in the current research would report greater engagement in LBs, both in the past and at Time 2. Managers generally reported more positive attitudes towards adopting LBs than non-managers. Perhaps this reflected their attempts to achieve psychological comfort through attitude-behaviour consistency (Festinger, 1957).

8.3.2.3.3. LSE-Time 2 Behaviour Relation

Based on the cross-sample weighted mean correlation, LSE had a medium-to-large positive effect on Time 2 behaviour (r = 0.42). This value is considerably higher than the weighted cross-sample mean correlation between PBC and Time 2 behaviour (r = 0.26). Furthermore, regressions confirmed that LSE, not PBC, was a significant independent predictor of Time 2 behaviour in the Ivax and CU samples. LSE also had a small-to-medium effect on the Time 2 behaviour of Arvin respondents (r = 0.18), whereas PBC had no effect (r = 0.03). Past research has reported that self-efficacy rather than PBC directly influences behaviour (Dzewaltowski et al., 1990; Manstead & van Eekelen, 1998; Norman & Conner, 2006; Povey et al., 2000) and some researchers (e.g. De Vries, Dijkstra, & Kuhlman, 1988) even select measures of self-efficacy (rather than PBC) in their tests of the TPB. The varying influence of LSE and PBC on behaviour supports arguments and past empirical research that PBC and self-efficacy are distinct concepts (Armitage & Conner, 1999a; Bandura, 1986, 1992; Dzewaltowski et al., 1990; Manstead & Van Eekelen, 1998; McCaul et al., 1993; Terry 1993; Terry & O'Leary, 1995; Trafimow et al., 2002; White et al., 1994).

Past research suggests that self-efficacy is positively related to employee proactivity (Morrison & Phelps, 1999; Silver et al., 1995; Speier & Frese, 1997). Role-breadth self-efficacy, the concept upon which the LSE measure was based, has been linked to employee suggestion-making, proactivity, innovation, autonomous working and knowledge management (Axtell et al., 2000; Axtell & Parker, 2003; Cabrera et al., 2006; Griffin et al., 2007; Parker, 2000; Parker et al., 2006). Self-efficacy theory states that people who feel confident in their ability to adopt particular behaviours are

more likely to engage in those behaviours (Bandura, 1982). Employees who felt confident about adopting the various LBs may have been more inclined to accept or seek out opportunities to engage in those behaviours. This would also explain the significant positive LSE-past behaviour correlation found consistently in the current study. However, past behaviour could also predict LSE because individuals who have already engaged in particular sets of behaviours tend to report greater self-efficacy to perform similar behaviours in the future (Bandura, 1982, 1997).

8.3.2.3.4. Job Satisfaction-Time 2 Behaviour Relation

The CU and Arvin results suggested that job satisfaction was a strong positive predictor of Time 2 behaviour, independent of the TPB variables - higher job satisfaction was associated with greater Time 2 engagement in LBs. Although no previous research has investigated the relation between job satisfaction and engagement in the full range of LBs, research does suggest that job satisfaction is associated with autonomous, empowering work and opportunities to make significant contributions to the work process (Eby, Freeman, Rush & Lance, 1999; Fried & Ferris, 1987; Hackman & Oldham, 1976; Liden, Wayne & Sparrowe, 2000; Renn & Vandenberg, 1995). Research also suggests that job satisfaction is a strong predictor of employee acceptance of Lean (Shadur et al., 1995), and Parker (2000) argues that "aiming for a committed and satisfied workforce is likely to be compatible with aiming to develop a more proactive one" (p. 463).

Social Exchange Theory could provide a theoretical justification for the positive job satisfaction-Time 2 behaviour relation. This theory states that a norm of social reciprocity operates when people feel obligated to return the goods, services and concessions offered by other individuals and groups (Bateman & Organ, 1983; Gouldner, 1960). Employees experiencing high levels of job satisfaction may voluntarily engage in the proactive and improvement behaviours characteristic of Lean as a form of reciprocation to the organisation for such high job satisfaction.

The Ivax job satisfaction-Time 2 behaviour correlation was relatively weak ($r = 0.09$), which is surprising because the Ivax job satisfaction-past behaviour correlation was moderately strong ($r = 0.38$). On average, employees reported somewhat neutral

feelings towards their job at Time 1 (M = 3.34). This may have reflected the insecurity and scepticism they were experiencing as a result of the recent merger with Teva. However, during the period between administering the questionnaires, job satisfaction levels are likely to have increased due to improved cross-site communication, enhanced organisational performance and the implementation of improvement projects which afforded employees greater opportunities for developing skills in decision-making, problem-solving and suggestion-making. These likely changes in job satisfaction could explain the fairly weak job satisfaction-Time 2 behaviour correlation at Ivax.

8.3.2.3.5. Organisational Commitment-Time 2 Behaviour Relation

The CU and Arvin analyses suggested that organisational commitment was a positive predictor of Time 2 behaviour, independent of the TPB variables - higher organisational commitment was associated with greater Time 2 engagement in LBs. Past research has not explicitly examined the relation between organisational commitment and employee engagement in the full range of LBs, but there is evidence to suggest that commitment is positively linked to employees adopting a flexible approach to their work, engaging in proactive work behaviours and accepting a TQM programme (Coyle-Shapiro & Morrow, 2003; Parker et al., 2006). Employees in jobs characterised by skill variety, participatory management and empowerment also tend to report higher organisational commitment (Castaneda, Dunham & Grube, 1994; Eby et al., 1999; Liden et al., 2000). Organisational commitment emerged as *the* strongest predictor of employee approval of Lean in Shadur et al.'s (1995) study.

It is plausible that employees committed to their organisation would have been willing and motivated to expend effort to engage in proactive behaviours such as suggestion-making, participative decision-making, problem-solving and volunteering for extra-role activities. According to Mowday et al. (1979), "highly committed employees are thought to be motivated to exert high levels of energy on behalf of the organization" (p. 236), a view shared by Iverson (1996). Based on definitions of organisational commitment (Allen & Meyer, 1990; Mowday et al., 1979), employees may have adopted LBs because they had a strong belief in, and acceptance of, their

organisation's goals/values; and/or were willing to exert considerable effort on behalf of their organisation. Cognitive dissonance theory (Festinger, 1957) could explain the organisational commitment-Time 2 behaviour relation. Engaging in proactive, improvement behaviours aimed at enhancing organisational performance would align with holding a positive attitude towards the organisation.

The Ivax organisational commitment-Time 2 behaviour correlation was moderately weak (r = 0.16) and considerably lower than the Ivax organisational commitment-past behaviour correlation (r = 0.33). Ivax respondents in general may have experienced increased levels of organisational commitment during the inter-questionnaire period due to their involvement in improvement projects that afforded them greater opportunities for autonomous, proactive working, job characteristics that employees tend to value (Hackman & Oldham, 1975). These likely increases in organisational commitment could explain the fairly weak organisational commitment-Time 2 behaviour correlation at Ivax.

8.3.2.3.6. Union Membership-Time 2 Behaviour Relation

Analyses of the Ivax and Arvin data suggested that union membership was a moderately strong negative predictor of Time 2 behaviour after controlling for the TPB variables. Non-union members were generally less like to engage in LBs at Time 2 compared to union members. The Ivax results also showed that union members had a more negative attitude towards their adoption of LBs than non-union members.

There is a growing body of literature suggesting that union members tend to resist Lean working practices, perceiving them to limit worker autonomy and discretion on the job and to lead to work intensification, greater job stress and longer working days (Berggren, 1993; Black & Ackers, 1994; Dore, 2000; Holmes & Schmitz, 1995; Rutherford, 2004; Stewart & Wass, 1998; Waddington, 1999). Potential job losses and negative impacts on the job environment are also the primary concerns of union members relating to employee involvement programmes (Eaton, 1990, 1994; Fantasia, Clawson & Graham, 1988; Greiner and Holger, 1991; Parker and Slaughter, 1988b; Reshef, Kizilos, Ledford, & Cohen, 1999).

Union members may be less receptive to Lean due to a group identification process by which they assume the characteristics, values and beliefs of the union to help establish a psychological linkage. Individuals who identify strongly with a group tend to view behaviour as a mechanism for reinforcing a social identity (Kelly & Kelly, 1992). Union members are also more likely to be aware through their union membership of the literature suggesting that Lean can have detrimental effects on worker health and well-being, and may draw on this evidence when deciding whether or not to adopt behaviours classed as Lean.

8.3.2.3.7. Neuroticism-Time 2 Behaviour Relation

The Ivax regression results suggested that neuroticism was a significant negative predictor of Time 2 behaviour and that, despite a significant negative neuroticism-attitude correlation, this effect was independent of the TPB variables. The lower employees scored on neuroticism, the greater their engagement in LBs at Time 2.

Ehigie et al (2006) found that people who scored low on neuroticism were significantly more likely to comply with TQM practices. There is also a mass of research demonstrating that employees who score low on neuroticism tend to report greater engagement in, and willingness to adopt, behaviours typically classed as Lean such as teamworking, goal/target-setting, problem-solving, multi-skilling and job rotation (Barrick et al., 1993, 1998; Bastian et al., 2005; Colquit et al., 2000; Judge & Ilies, 2002; Karuppan, 2004; LePine & van Dyne, 2001; Malouff et al., 1990; Mount et al., 1998; Thoms et al., 1996). Emotionally stable individuals are also more willing to undertake extra-role activities (Borman et al., 2001).

Neuroticism reflects a tendency for individuals to experience emotions such as anxiety, stress, insecurity, tension, nervousness and worry (Digman, 1990). Based on this definition, it is plausible that people scoring low on neuroticism would be more likely to engage in LBs. They are likely to feel comfortable and secure in teamworking situations and presenting information and ideas to colleagues; to have the confidence to set goals; to feel as ease with the uncertainty and potential frustration associated with problem-solving; to feel confident about rotating jobs and tasks with colleagues, learning new skills and making suggestions for improvement;

and to feel secure in making decisions, using one's initiative, and assuming an autonomous, proactive role within the workplace.

8.3.2.3.8. Agreeableness-Time 2 Behaviour Relation

The Arvin results suggested that agreeableness was a strong negative predictor of Time 2 behaviour - higher agreeableness was associated with less engagement in LBs at Time 2. Agreeableness was also negatively correlated with past behaviour among Arvin respondents. These findings conflict with past research showing that people scoring high on agreeableness are more likely to engage in LBs such as team-working, problem-solving, participative decision-making and volunteering for extra-role activities (Barrick et al., 1998; Bastian et al., 2005; Borman et al., 2001; LePine et al., 2001; Morgeson et al., 2005; Mount et al., 1998; Organ & Ryan., 1995; Stevens & Ash, 2001; Thoms et al., 1996). They are also inconsistent with findings from the Rizla and Ivax datasets, which show agreeableness and engagement in LBs to be positively related. The reasons for these inconsistencies are not clear. They may reflect the fact that the Arvin sample consisted of only engineers; perhaps agreeableness is negatively related to engagement in LBs among engineers.

8.4. TPB Predictors as Mediators of Personality-intentions Relations

Personality data were collected from Rizla, Ivax and Arvin respondents. In the Rizla and Arvin samples there were no significant correlations between the 'Big Five' personality traits and intentions and thus there were insufficient grounds to test the mediating role of the TPB predictors in the personality-intentions relations with these two samples. However, the Ivax results suggested that the openness-intentions relation was mediated by both attitude and PBC. This finding supports Ajzen's (1991) argument that the influence of a non-TPB variable (openness) on intentions should be mediated by the TPB variables.

Openness represents the extent to which someone is imaginative, inventive, original, curious, cultured, creative and broad-minded. It is clearly relevant to a number of LBs (using one's initiative, suggestion-making, problem-solving, job rotation, skill variety, planning one's work). If an employee is open to new experiences, creative

and open-minded, then intuitively one would expect them to have a positive attitude towards their adoption of LBs, and to evaluate positively their ability to perform behaviours which reflect and endorse this aspect of their personality.

In their study of the determinants of university students' examination performance, Philips et al. (2003) reported that openness directly predicted intentions, over and above the TPB variables. However, their sample size was relatively small (n = 125) and hence their results should be interpreted cautiously. The discrepancy between their finding and that of the current study could reflect the fact that very different behaviours were being explored.

8.5. Personality as Moderator of TPB Predictor-intentions Relations

Table 8.5 summarise the results from the analyses conducted to test whether personality moderates the TPB predictor-intentions relations. Ticks indicate that a significant moderating effect was found. Although no consistent pattern emerges, the results will be summarised and discussed for each of the samples.

Table 8.5: The Moderating Role of Personality in TPB Predictor-intentions Relations

	Attitude-intentions relation					Subjective norm-intentions relation					PBC-intentions relation				
	Personality trait					Personality trait					Personality trait				
	O	C	E	A	N	O	C	E	A	N	O	C	E	A	N
Rizla															
Ivax						✓									✓
Arvin				✓						✓					

Note: O = openness, C = conscientiousness, E = extraversion, A = agreeableness, N = neuroticism; ✓ = significant moderating effect.

For Ivax respondents, openness moderated the subjective norm-intentions relation, with subjective norm being a stronger predictor of intentions under low than moderate or high levels of openness. Individuals who are low on openness are less original, creative and broad-minded than those high on openness. Based on this

definition, it is plausible that they would be more likely to base their behavioural decisions on how they think others would evaluate their behaviour.

The Ivax results also suggested that neuroticism moderated the PBC–intentions relation, with PBC being a stronger predictor of intentions under low than moderate or high levels of neuroticism. Presumably people scoring lower on neuroticism felt more confident and able to base their behavioural intentions on their perceived control to adopt LBs compared to people scoring higher on neuroticism.

The Arvin results suggest that agreeableness moderated the attitude-intentions relation. Attitude was a significant positive predictor of intentions for people with high levels of agreeableness but a non-significant negative predictor of intentions for people with low levels of agreeableness. This may reflect a tendency for individuals high in agreeableness to be more consistent in their cognitions. However, the Arvin sample size was very small and hence this finding should be interpreted with caution. It was also not observed in the other samples.

The Arvin results also indicated that neuroticism moderated the subjective norm-intentions relation. Subjective norm was a stronger predictor of intentions under low than moderate or high levels of neuroticism. Perhaps the anxiety, stress, etc that characterise people high in neuroticism leads to less social awareness, resulting in a weaker influence of subjective norms on intentions. This finding is, however, inconsistent with Rhodes et al. (2005), who found that, within the exercise domain, subjective norm was a stronger predictor of intentions for people with high levels of insecurity than for people with low levels of insecurity. They argue that, compared to secure people, insecure people are more normatively influenced in their behavioural intentions and hence are more likely to look to others for guidance and social cues when forming actions. Despite this plausible explanation, the authors do note that the mean centering they employed prior to conducting the moderation analyses was not entirely successful, and that their results are based on a convenience sample of university undergraduates.

8.6. Personality as Moderator of Intentions-Behaviour Relation

Personality and Time 2 behaviour data were collected from Ivax and Arvin. Neither sample revealed a significant moderating effect of personality on the intentions-behaviour relation. This finding echoes that of Chorlton (2007), who reported that personality did not moderate the relation between people's intentions to speed and their speeding behaviour in a driving simulator. Past research within the exercise domain has, however, found that conscientiousness moderates the intentions-behaviour relation (Rhodes et al., 2002, 2005). Norman and Conner (2005) even argue that conscientiousness could be one of the most significant moderators of the intentions-behaviour relationship on the grounds that highly conscientious individuals exhibit greater intentions-behaviour consistency due to their ambition to achieve their plans and ambitions, their drive to overcome any obstacles to action and their organised and self-disciplined nature. Conner and Abraham (2001) and Rhodes et al. (2002) express a similar view.

However, Conner, Rodgers and Murray (2007) recently found that conscientiousness significantly moderated the intentions-behaviour relationship when the behaviour was performed in an unusual context, but did not do so when it was performed in a usual context. They argue that high levels of conscientiousness are not needed for frequently performed behaviours carried out in stable environments because the barriers to performance are well known. By contrast, in unstable environments or new contexts in which barriers are unknown and unexpected, high degrees of conscientiousness are likely to help individuals to overcome any barriers and act upon their intentions. Because many employees were engaging in LBs a reasonable amount at Time 1 and hence were likely to have been familiar with any barriers to adopting LBs, and because past behaviour had an overwhelming influence on Time 2 behaviour, Conner et al.'s (2007) argument could explain why conscientiousness did not moderate the intentions-Time 2 behaviour relation in the current study.

The two studies conducted by Rhodes and colleagues (2002, 2005) measured exercise behaviour only two weeks after collecting personality and intentions data. In the current study, behaviour data was collected months after collecting the personality and intentions data. This could partly explain the absence of a significant

moderating effect of personality in the current study. Alternatively, the moderating effect of personality may be specific to exercise behaviour.

8.7. Personality and LSE

LSE consistently had a significant positive correlation with openness and conscientiousness. The Rizla and Ivax results also suggested that LSE had a significant positive correlation with extraversion, and a significant negative correlation with neuroticism. Because the LSE construct was constructed for the present research, there is no prior work looking at the relationship between LSE and personality. However, Griffin and Hesketh (2005) reported a positive correlation between conscientiousness and self-efficacy for behaving adaptively, and a number of studies, some meta-analytic, have explored the links between personality and generalised self-efficacy and reported a similar pattern of results to those found in the current study (Judge et al., 2002; Judge & Ilies, 2002; Rottinghaus, Lindley, Green & Borgen, 2002).

The regression analyses confirmed that openness was consistently the only personality trait to be a significant independent predictor of LSE. Cabrera et al. (2006) found that RBSE had a significant positive relationship with openness but no relationship with agreeableness or conscientiousness. Extraversion and neuroticism were not measured. The findings of Cabrera et al. (2006) and those of the present research emphasise the importance of the openness construct in determining employee confidence to adopt a broader, more proactive role within the workplace. Given the definition of openness and its relevance to LBs noted in Section 8.4, it is intuitive that employees scoring high on openness would have a positive evaluation of their ability to perform behaviours which reflect and endorse this aspect of their personality.

Thoms et al. (1996) investigated the relationship between the 'Big Five' and self-efficacy for participating in self-managed work groups, an activity which involves several LBs (teamworking, problem-solving, decision-making). They failed to find a significant relationship between openness and self-efficacy, a finding that they considered "unexpected and perhaps counterintuitive" (p. 358). They suspect that

this was due to the openness scale they used, the NEO-FFI (Costa & McCrae, 1992), which contained many items concerned with cultural rather than work experiences. Only two of the 10 items used to measure openness in the current study were related to culture and one item even explicitly asked about preferences for work that is routine. The use of different openness measures could explain these inconsistent findings and why the current study revealed a significant positive openness-LSE correlation.

8.8. Attitude, Age, Organisational Tenure and Gender

Overall, the findings revealed that attitude was not significantly related to age or to organisational tenure. This is surprising because past research suggests that employees with longer tenure are more likely to have negative attitudes to management strategies such as Lean and to resist change than employees with shorter tenure (Iverson, 1996; Parker, 2000; Stewart & Wass, 1998). Older employees also tend to feel more threatened by having to learn new responsibilities and having to engage in new work methods than younger employees (Axtell et al., 2000). Perhaps some of the older and longer tenured employees had less favourable attitudes towards adopting LBs because it would involve them abandoning an established and more traditional way of working while others, due to their age and longer tenure, were more aware of organisational problems and how they could be overcome by assuming a more autonomous and proactive role. Only the CU sample provided support that females would have a more positive attitude towards their adoption of LBs than males. Jackson (2004) reported that females are more committed to quality initiatives than males. Perhaps gender differences relating to employee attitudes towards adopting LBs only apply to people working in a service organisation or more specifically people working in a university.

8.9. Belief Data

Table 8.6 reports for the Rizla, Ivax and Arvin samples the percentage of questionnaire respondents reporting the various beliefs about adopting LBs mentioned in the sample's respective interviews/focus groups; the correlation each belief has with the sample's respective direct attitude measure; and the mean

behavioural belief scores of non-intenders and intenders and whether the differences between them are statistically significant[70]. The data relating to the percentages reporting the beliefs will be contrasted with the Lean literature to determine the extent to which employees hold beliefs similar to some of the widely popularised outcomes of, and motivations for, implementing Lean. The belief data will also be discussed in light of the circumstances under which Lean was introduced within the organisation. Table 8.7 compares across the four samples the salient referent and PBC data, and the mean belief scores of non-intenders and intenders and any significant differences between them. The latter part of this section will briefly discuss these findings.

[70] Because a different procedure was used to collect the CU belief data (see Section 7.3), it is not included in Table 8.6 but will be discussed separately.

Table 8.6. Cross-sample Comparisons of Behavioural Belief Data

Behavioural beliefs	% reporting belief			Correlation with direct attitude			Behavioural belief means for non-intenders (NI) and intenders (I)								
							Rizla			Ivax			Arvin		
	Rizla	Ivax	Arvin	Rizla	Ivax	Arvin	NI	I	Sig	NI	I	Sig	NI	I	Sig
Increase profits at company	78.5	69.6	74.0	0.42**	0.43***	0.40*	0.00	1.56	*	0.49	1.19	***	0.20	1.05	
Help me to work smarter/more efficiently	77.5	77.5	85.1	0.21	0.52***	0.49*	0.33	1.36		0.43	1.58	***	1.00	1.38	
Contribute to job losses at company	49.9	28.8	29.6	-0.03	0.03	0.10	1.17	0.53		-0.27	-0.51		-0.80	-0.24	
Improve quality of products	66.7	63.6	51.8	0.29	0.35***	0.44*	-0.33	1.24	*	0.40	1.15	***	-0.20	0.62	
Make my job more stressful	26.2	28.9	48.1	-0.22	-0.19**	-0.38*	0.33	-0.44		-0.20	-0.34		0.60	0.33	
Increase productivity at company	71.4	72.0	59.2	0.37*	0.32***	0.31	0.17	1.32		0.53	1.41	***	0.00	0.57	
Increase my job satisfaction	43.9	63.4	37.0	0.28	0.48***	0.35	0.00	0.38		0.08	1.22	***	-1.00	0.62	*
Contribute to this site closing	17.1	8.4	7.7	-0.18	-0.14*	-0.56**	0.33	-0.88		-1.43	-1.86	*	-0.75	-1.57	
Increase my work motivation	56.1	61.6	38.4	0.24	0.46***	0.46*	-0.50	0.82	*	0.17	1.11	***	-1.00	0.50	*
Make my job more interesting	43.9	58.7		0.27	0.40***		-0.17	0.50		0.11	1.07	***			
Reduce the amount of work in progress	57.5	64.2		0.34*	0.36***		-0.17	0.97		0.28	1.06	***			
Boost morale at company	51.2	58.2		0.23	0.47***		-0.83	0.67		0.10	0.79	**			
Improve communication at company	55.0	59.5		0.38*	0.40***		-0.17	0.82		0.18	0.98	***			
Create more efficient production process/improve company efficiency	78.1	74.8		0.50**	0.46***		0.33	1.62	*	0.51	1.55	***			
Improve/streamline processes/procedures		71.8	65.4		0.50***	0.41*				0.39	1.44	***	0.50	0.81	
Create space	80.4			0.28			0.83	1.56	*						
Make working conditions at company worse	10.0			-0.48**			0.60	-1.26	*						
Create safer working environment	56.1			0.23			0.17	1.03							
Make my job less frustrating		59.3			0.45***					0.13	1.06	***			
Help me to save time		69.1			0.48***					0.35	1.38	***			
Make company more competitive		73.9			0.47***					0.53	1.53	***			
Help to reduce costs within company		71.6			0.51***					0.54	1.49	***			
Help company save time and money			85.1			0.71***							0.40	1.57	
Improve my work performance			70.3			0.66***							0.20	1.00	
Increase my workload			48.1			-0.24							0.40	0.76	
Contribute to delayed completion of jobs			29.6			-0.59**							0.60	-0.57	
Increase the number of errors made			29.6			-0.41*							0.20	-0.38	
Give me more time to develop new ideas			25.9			0.16							-0.60	-0.10	
Contribute to decline in customer satisfaction			18.5			-0.67***							0.20	-1.19	

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 8.7. Cross-sample Comparisons of Salient Referent and PBC data

	Rizla				Ivax				Arvin				CU			
	% with belief	NI	I		% with belief	NI	I		% with belief	NI	I		% with belief	NI	I	
Salient referent																
Most people important to me	46.1	-0.67	1.19	**	34.3	-0.44	0.41	***	25.9	-0.60	0.43		25.2	-0.45	0.66	***
Co-workers	50	-0.67	0.97	**	34.0	-0.35	0.41	***	25.9	-0.80	0.19	*	24.6	-0.53	0.68	***
Manager/supervisor	87.5	0.67	2.30	**	65.6	0.52	1.48	***	63.0	1.20	1.10		37.4	-0.25	1.13	***
PBC Items																
Adopting LBs at this company in the next 6 months is easy for me to do	70.8	0.33	1.50	*	65.6	0.14	1.34	***	74.1	0.20	1.10		48.1	-0.19	1.54	***
I feel confident that I can adopt LBs at this company in the next 6 months	80.5	0.17	1.88	**	78.2	0.41	1.65	***	81.5	0.20	1.38		52.0	-0.16	1.75	***
If I wanted to, I could easily adopt LBs at this company in the next 6 months	80.4	0.17	1.91	**	71.3	0.39	1.53	***	77.8	-0.20	1.33	*	52.1	-0.11	1.68	***
There are few barriers to my adopting LBs at this company in the next 6 months	48.9	-0.50	0.88	*	57.8	0.12	0.94	***	46.2	-1.00	0.62		40.4	-0.28	0.96	***
I can control whether I decide to adopt LBs at this company in the next 6 months	47.5	-0.17	0.06		43.3	-0.55	0.48	***	33.3	-1.80	0.14	*	37.6	-0.45	1.02	***

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, NI = non-intenders, I = intenders

8.9.1. Rizla, Ivax and Arvin Behavioural Beliefs

What is initially striking from the results in Table 8.6 is that employees in each of the three organisations held a number of common positive beliefs regarding the outcomes of their adoption of LBs. Over three-quarters of respondents[71] in each of the organisations believed that their adoption of LBs would help them to work smarter/more efficiently, over two-thirds believed that it would increase company profits, and over half believed that it would improve the quality of products and increase company productivity. Around two-thirds of Ivax and Arvin respondents expected improved/streamlined processes/procedures as an outcome; a more efficient production process/improved company efficiency was expected by approximately three-quarters of Rizla and Ivax respondents; and over half of Rizla and Ivax respondents expected a reduction in the amount of work in progress. Many organisations implement Lean to achieve these objectives (Womack et al., 1990) and there are countless examples of how Lean has contributed to these outcomes (Fujimoto, 1999; Krafcik, 1988; Liker, 2004; MacDuffie 1995; Monden, 1983; Ohno, 1988; Shah & Ward, 2003; Shingo, 1988; Womack et al. 1990; Wood et al., 2004).

Compared to Arvin respondents, around 12% more people at Rizla and Ivax reported beliefs that adopting LBs would improve the quality of products and increase company productivity. This could be because one of the reasons Rizla and Ivax implemented Lean was to improve their performance in both quality and productivity terms. Rizla was being perpetually benchmarked against its sister site in Belgium using the primary measure of productivity and cost, and the most cost efficient of the two sites was likely to absorb all production leading to the closure of the other site; the Ivax site was being challenged to re-invent itself in terms of its business model and cost profile, and would be expected to reduce costs and waste, and to ramp up production in the forthcoming months. In contrast, Arvin's motivation to implement Lean centred more on encouraging greater innovation, teamworking and job rotation among the engineers rather than improving quality and increasing productivity. The interviews suggested that employees in each of the organisations had a reasonable

[71] Unless stated otherwise in Section 8.8, 'respondents' refers to 'questionnaire respondents' as opposed to interview/focus group participants.

understanding of the issues facing the business and the need for change. Arguably, employees used this information to make judgments about the possible outcomes of adopting LBs.

Radnor et al.'s (2006) study into the application of Lean to public services reported that a rise in employee motivation, satisfaction and morale were some of the intangible benefits of implementing Lean. Other studies have reported that Lean and Lean-related practices can increase employee satisfaction among manufacturing personnel, boost morale and create interesting, rewarding jobs (Jackson & Martin, 1996; Mullarkey et al., 1995; Womack et al., 1990; Wright & Lund, 2006). Heightened motivation and job satisfaction were outcomes expected by many respondents in the current study and around a half of Rizla and Ivax respondents expected a boost in morale and their jobs to become more interesting as a result of adopting LBs.

Communication is recognised as a vital part of any successful Lean implementation (Jenner, 1998; Radnor et al., 2006; Spear & Bowen, 1999; Tracey & Flinchbaugh, 2006; Womack et al, 1990; Worley & Doolen, 2006) and Lean practices can improve company-wide communication (Worley & Doolen, 2006). Over half of Rizla and Ivax respondents expected their adoption of LBs to improve communication within their organisation.

Negative outcomes of adopting LBs were reported, namely job losses and making jobs more stressful. There is a mass of research linking Lean with these outcomes (Achanga et al., 2006; Berggren, 1993; Conti et al., 2006; Garrahan & Stewart, 1992; Grunberg et al. 2000; Jackson & Mullarkey, 2000; Landbergis et al., 1999; Millman, 1996; Parker & Slaughter, 1988a; Turnbull, 1988; Turner, 1996). Potential job losses were also an expected outcome of workers in companies introducing employee involvement programmes (Leana, Ahlbrandt & Murrell, 1992).

Half of the Rizla respondents linked their adoption of LBs with job losses, compared to around a quarter of the Ivax and Arvin respondents. 17% of the Rizla respondents reported site closure as an outcome, compared to less than 9% of the Ivax and Arvin respondents. These findings probably reflect the real threat of job losses and closure

at Rizla. If the South Wales Rizla site did not outperform its sister site in Belgium, it would close and all employees would lose their jobs. Linking the adoption of LBs with job losses and site closure was a recurrent theme in the Rizla interviews.

Compared to the Rizla and Ivax respondents, many fewer Arvin respondents expected their adoption of LBs to increase their work motivation or job satisfaction but many more expected it to make their job more stressful. Almost half of the Arvin respondents associated their adoption of LBs with an increase in workload. Many of the engineers reported in the interviews that they considered there to be a lack of manpower within the department. They may have felt that, rather than addressing this perceived staff shortage, the department had decided to implement Lean in order to encourage the engineers to take on more work, which could, in turn, make their jobs more stressful.

It is important to note that the Arvin sample was distinctly different from the Rizla and Ivax samples. Whereas the Arvin sample consisted only of office-based engineers operating in a service role, the Rizla and Ivax samples were more varied and consisted of manufacturing, service, shopfloor, office-based and management employees. This could explain why some of the beliefs about the consequences of adopting LBs reported by the Rizla and Ivax samples (such as making their jobs more interesting, reducing the amount of work in progress, improving company communication, and creating a more efficient production process/improved company efficiency) were not reported by the Arvin respondents in the interviews.

A number of organisation-specific beliefs emerged. Over 80% of Rizla respondents believed that adopting LBs would create space and over half believed that it would create a safer working environment. Indeed one of the objectives of Lean is to do more in less space (Monden, 1983; Ohno, 1988; Shingo, 1988; Womack & Jones, 2003) and one of the purposes of 5S, a popular Lean tool, is to create a safer working environment (Massey & Williams, 2005). These beliefs possibly stem from the fact that one of the principal motivations for implementing Lean at the Rizla site was to help consolidate the production process from two buildings into one. This would require freeing up space and creating a clutter-free, arguably safer working environment.

Over 70% of Ivax respondents associated their adoption of LBs with improving company competitiveness and helping to reduce company costs. These were the overriding objectives for the Waterford site implementing Lean and it is therefore not surprising that these beliefs were particularly common. Around two thirds expected their adoption of LBs to help them to save time and make their job less frustrating, outcomes which are arguably related to worker smarter/more efficiently. According to Womack et al. (1990), Lean can lead to each of these outcomes.

8.9.2. CU Behavioural Beliefs

For reasons discussed in Section 7.3, interviews were not conducted at CU. Instead, the behavioural belief data was captured by asking respondents to state in the Time 1 questionnaire what they considered to be the advantages and disadvantages of their adopting of LBs. The most common advantages mentioned were related to (in descending order) greater efficiency and effectiveness, saving time/better time management and improving/streamlining procedures. These findings reflect some of the outcomes mentioned by the other samples. Over three-quarters of Rizla, Ivax and Arvin respondents believed that adopting LBs would help them to work smarter/more efficiently, and around three-quarters of Rizla and Ivax respondents believed that it would create a more efficient production process/improve company efficiency. Around two-thirds of Ivax and Arvin respondents mentioned improved/streamlined processes/procedures as an outcome, and over two-thirds mentioned saving time as an outcome of adopting LBs.

The most commonly mentioned disadvantage related to the time required. The CU data were collected during a period when many academics and administrative staff would have been focusing their efforts on securing outputs for the upcoming 2008 Research Assessment Exercise, which could explain this finding. Alternatively, this finding may reflect a fundamental belief among academic faculty that the adoption of Lean is a time-consuming process. Indeed, the application of TQM practices to academia has been criticised for the large amounts of time taken away from teaching and research (Roffe, 1998).

8.9.3. Correlations between Behavioural Beliefs and Attitude

Across all three manufacturing samples, respondents who believed that their adoption of LBs would increase company profits were significantly more likely to have a positive attitude towards adopting LBs. Rizla and Ivax respondents who expected increased company productivity, improved communication, reduced work in progress, or a more efficient production process/improved company efficiency as outcomes were significantly more likely to report positive attitudes. Ivax and Arvin respondents who reported beliefs that their adoption of LBs would: improve the quality of products; not make their job more stressful; help them to work smarter/more efficiently; not contribute to the site closing; increase their work motivation or improve/streamline processes/procedures; tended to report significantly more positive attitudes towards adopting LBs.

The overall tendency was for positively evaluated outcomes to be associated with positive attitudes towards adopting LBs, and negatively evaluated outcomes to be associated with negative attitudes towards adopting LBs. These findings are in accordance with the theory surrounding the attitude component of the TPB (Ajzen, 1991).

8.9.4. Comparing Behavioural Beliefs of Non-intenders with Intenders

Across the Rizla, Ivax and Arvin samples, intenders were significantly more likely than non-intenders to believe that their adoption of LBs would increase their work motivation. Rizla and Ivax intenders were significantly more likely than their non-intending counterparts to believe that outcomes would include increased company profits, improved quality of products, and a more efficient production process/improved company efficiency. CU intenders were significantly more likely than CU non-intenders to believe that their adoption of LBs would be associated with greater efficiency and effectiveness. Ivax and Arvin intenders were significantly more likely than their non-intending counterparts to expect increased job satisfaction. Overall, compared to non-intenders, intenders were generally more likely to believe that their adoption of LBs would lead to positively evaluated outcomes, which is in accordance with the TPB (Ajzen, 1991).

8.9.5. Salient Referent Beliefs

Across all four samples, respondents were more likely to believe than their manager/supervisor thought that they should adopt LBs than their co-workers or most people important to them. Over 60% of Rizla, Ivax and Arvin respondents believed that their manager/supervisor thought that they should adopt LBs. Around one-quarter of Arvin and CU respondents believed that their co-workers would support their adoption of LBs. This was as high as 34% and 50% for the Ivax and Rizla samples, respectively.

Across all four samples, non-intenders believed that co-workers would not support their adoption of LBs, whereas intenders believed that co-workers would do so. The differences between non-intenders and intenders were statistically significant for all samples. For Rizla, Ivax and CU respondents, intenders were significantly more likely than non-intenders to believe that their manager/supervisor would support their adoption of LBs. These findings are in accordance with the TPB (Ajzen, 1991).

8.9.6. PBC Items

In all four samples intenders, compared to non-intenders, were significantly more likely to believe that, if they wanted to, they could easily adopt LBs. Rizla, Ivax and CU intenders were more likely than their non-intending counterparts to believe that adopting LBs would be easy for them to do, that they felt confident that they could adopt LBs, and that there were few barriers to their adopting LBs. Ivax, Arvin and CU intenders generally believed that they could control whether they decided to adopt LBs, whereas non-intenders did not. Overall, compared to non-intenders, intenders were generally more inclined to perceive control with respect to adopting LBs, which is consistent with the theory surrounding the PBC construct in the TPB (Ajzen, 1991).

8.10. Summary of Results

Respondents across the organisations generally held positive beliefs about adopting LBs, and intenders were more likely to hold positive beliefs than non-intenders. An

average weighted 57.4% of the variance in intentions was explained by attitude, subjective norm and PBC. PBC was a significant predictor of intentions with all four samples; attitude and subjective norm were also significant predictors of intentions with the larger Ivax and CU samples. The non-TPB variables did not predict intentions independently of the TPB variables. Based on the cross-sample weighted mean correlations, intentions and PBC only had small-to-medium effects on Time 2 behaviour and together explained a weighted average of 9.6% of the variance in behaviour. Some of the samples revealed past behaviour, employee level, LSE, job satisfaction, organisational commitment, union membership and neuroticism as significant predictors of Time 2 behaviour independently of the TPB variables. Generally, mixed results were found regarding the personality-TPB interaction although two samples revealed no significant moderating effect of personality on the intentions-behaviour relation. Openness consistently emerged as the only personality trait with a significant independent effect on LSE.

Chapter 9
Conclusions, Implications, Limitations and Future Research

9.1. Introduction

The current study has explored the largely under-researched area of employee motivation for Lean by collecting interview/focus group and questionnaire data from employees in four organisations in the early stages of their Lean implementations. Data have been analysed both within and across organisations and the results have been discussed in relation to past research. This chapter serves to pull the findings together to address the five research questions outlined in Section 2.6, and to draw some conclusions from the study. The practical implications of the findings for organisations implementing Lean in terms of designing work environments, communication, training and the use of personality inventories for recruitment are explored. Limitations of the research and appropriate directions for future research are discussed.

9.2. The Research Questions

9.2.1. What are the beliefs of employees regarding the outcome of their adoption of LBs, and to what extent does the strength of those beliefs vary according to whether an employee reports intentions to adopt LBs?

Many employees in each of the manufacturing companies held similar positive beliefs about adopting LBs, namely that it would help them to work smarter/more efficiently, increase company profits, improve the quality of products manufactured, increase company productivity and heighten employee motivation and job satisfaction. A popular belief among Ivax and Arvin respondents related to improved/streamlined processes/procedures. Many Rizla and Ivax respondents expected a more efficient production process/improved company efficiency, reduced work in progress, a boost in morale, more interesting jobs and improved communication. Although a different method was used to collect the CU belief data,

similar positive outcomes emerged: that adopting LBs was related to greater efficiency and effectiveness, saving time/better time management and improving/streamlining procedures. Some manufacturing respondents expected negative outcomes, particularly job losses and increased job stress.

To conclude, irrespective of organisational context (manufacturing or service), employees in this set of four organisations tended to hold favourable beliefs about adopting LBs and to perceive that doing so could enhance their experiences of work and the prosperity of the organisation. Although no previous research has systematically explored employee beliefs about engaging in LBs, a number of researchers have argued that employees tend to react negatively to Lean (Benders, 1996; Berggren, 1993; Delbridge, 1998, 1995; Ezzamel et al., 2001; Grönning, 1995; Radnor et al., 2006; Rehder, 1994). Perhaps the perceived employee resistance to Lean reported by other authors is due to non-motivational factors such as organisational processes or culture. Alternatively, employees more positively disposed to Lean may have been more inclined to invest the time and effort required to complete the fairly lengthy Time 1 questionnaire, which could explain the overwhelmingly positive beliefs about adopting LBs found in the current study. The researcher will return to these issues in Section 9.4 when discussing limitations and future research avenues.

Across all three manufacturing samples, intenders were significantly more likely than non-intenders to believe that their adoption of LBs would increase their work motivation. Rizla and Ivax intenders were significantly more likely than their non-intending counterparts to believe that it would increase company profits, improve the quality of products manufactured, and make a more efficient production process/improve company efficiency. Ivax and Arvin intenders were significantly more likely than their non-intending counterparts to believe that it would increase their job satisfaction. Overall, the results suggest that, compared to non-intenders, intenders were generally more likely to believe that their adoption of LBs would lead to positively evaluated outcomes and less likely to believe that it would lead to negatively evaluated outcomes.

9.2.2. To what extent can Ajzen's (1991) TPB explain employee intentions to adopt, and future employee engagement in, LBs?

Based on the regression analyses, PBC was the only TPB variable to be a significant independent predictor of intentions across all four samples. The more employees reported perceptions of control with respect to adopting LBs, the greater their reported intentions to adopt LBs. Attitude and subjective norm were significant independent predictors of intentions among Ivax and CU respondents but not among Rizla and Arvin respondents, despite having at least small-to-medium effects on intentions. The small Rizla and Arvin sample sizes are a very likely explanation for the absence of statistically significant independent effects of all three TPB predictors. It is concluded that intentions are also significantly and positively influenced by attitude and subjective norm - the more positive an employee's attitude towards adopting LBs, or the more positive his or her subjective norm to adopt LBs, the stronger his or her intentions to adopt LBs. To summarise, employee intentions to adopt LBs are influenced by PBC, attitudes and subjective norms. A weighted average of 57.4% of the variance in intentions was explained by the TPB predictors across the four samples, suggesting that the TPB is a useful model for understanding employee intentions to adopt LBs.

Time 2 behaviour had a cross-sample weighted mean correlation of 0.23 and 0.26 with intentions and PBC, respectively. These correlations suggest that intentions and PBC each had, on average, only small-to-medium effects on Time 2 behaviour. Analysis of the Ivax and CU data suggested that neither intentions nor PBC was a significant independent predictor of Time 2 behaviour, and that intentions and PBC together explained a weighted average of only 9.6% of the variance in Time 2 behaviour. It is concluded that intentions and PBC have limited ability to predict future employee engagement in LBs and that, overall, the TPB is not a good model for understanding future employee engagement in LBs. Section 8.3.2 discusses in detail possible reasons for this. These include the small sample sizes, the limited volitional control inherent in engagement in LBs, potential changes in intentions and PBC during the inter-questionnaire period, lack of scale correspondence in the intentions, PBC and behaviour measures, and the potential impact of non-TPB variables, particularly past behaviour, on future behaviour.

9.2.3. To what extent are non-TPB variables (job-related and person-related) predictors of employee intentions to adopt, and future employee engagement in, LBs independent of the TPB predictors?

Among the larger Ivax and CU samples, the non-TPB job-related variables of job satisfaction, organisational commitment, past behaviour and LSE were each significantly and positively correlated with intentions - the greater the job satisfaction, organisational commitment, past engagement in LBs or LSE, the stronger the intentions to adopt LBs. However, neither of these non-TPB variables emerged as a significant independent predictor of intentions after controlling for the TPB predictors. Attitude partially mediated the relations between intentions and job satisfaction and organisational commitment, and attitude and PBC mediated the LSE-intentions relation. Past behaviour had a virtually zero beta weight in predicting intentions when the TPB predictors were entered into the equation. The Ivax results suggested a significant positive correlation between intentions and conscientiousness, agreeableness, openness and extraversion, and the CU results suggested that managers and females were significantly more likely to report intentions to adopt LBs than non-managers and males. However, the effects of these non-TPB variables on intentions were virtually zero when the TPB predictors were entered into the regression equations. It is therefore concluded that, although some non-TPB variables are significantly related to employee intentions to adopt LBs, these relationships are not independent of the TPB variables.

Based on the cross-sample weighted mean correlations between Time 2 behaviour and all the TPB and non-TPB variables measured in the study, the strongest correlates with Time 2 behaviour were, in descending order, the job-related variables of past behaviour (the greater the engagement in LBs at Time 1, the greater the engagement in LBs at Time 2), employee level (managers were more likely to engage in LBs at Time 2 compared to non-managers), and LSE (the greater the LSE, the greater the engagement in LBs at Time 2). Regression analyses of the Ivax and CU data confirmed that each of these non-TPB variables had a direct effect on Time 2 behaviour independent of the TPB variables. The Arvin results suggested that past behaviour had a medium-to-large effect on Time 2 behaviour, and that LSE had a

small-to-medium effect[72]. Both effects were independent of the TPB variables. Some of the samples revealed that the non-TPB variables of job satisfaction, organisational commitment, union membership and neuroticism were significant predictors of future employee engagement in LBs, independent of the TPB variables. The higher the job satisfaction or organisational commitment or the lower the neuroticism, the greater the engagement in LBs at Time 2; union members were generally less likely to engage in LBs at Time 2 compared to non-union members. To summarise, some non-TPB variables are predictors of future employee engagement in LBs independent of the TPB variables.

Past behaviour explained 58.3% and 12.2% of the variance in Time 2 behaviour among CU and Ivax respondents, respectively. Although common method variance could partly explain these large percentages, the researcher agrees with Conner and Armitage (1998) and considers such percentages probably too large to be solely attributable to measurement factors and instead could reflect the importance of the past behaviour construct in predicting future behaviour.

Based on the overwhelming influence of past behaviour on future behaviour independent of the TPB constructs, it could be argued that past behaviour should be included in the TPB model and conceptualised as a direct predictor of behaviour. Ajzen (1991) acknowledges that the "the theory of planned behaviour is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intentions or behaviour after the theory's current variables have been taken into account" (p. 199). However, Ajzen (1991, 2002) also maintains that if past behaviour explains significant additional variance in intentions and behaviour beyond the predictor variables contained in the TPB, then this could highlight the importance of other socio-cognitive variables not included in the model. The literature has considered a number of such variables including self-identify and anticipated affect (Ajzen, 1991; Conner & Armitage, 1998; Norman & Conner, 2005). Given that only a limited number of non-TPB variables were

[72] Recall that all Arvin respondents were non-managers; hence it was not possible to asses the impact of employee level on the behaviour of Arvin respondents.

included in the present research[73], it is difficult to draw firm conclusions regarding the past behaviour-future behaviour relation with regard to LBs.

9.2.4. To what extent is LSE related to the 'Big Five' personality traits?

LSE consistently had a significant positive relation with openness and conscientiousness. The Rizla and Ivax results also suggested that LSE had a significant positive correlation with extraversion, and a significant negative correlation with neuroticism. Regression analyses confirmed that openness was consistently the only personality trait to be a significant independent predictor of LSE.

9.2.5. With respect to LBs, how does personality interact with the TPB variables?

The Ivax and Arvin samples both revealed no significant moderating effect of personality on the intentions-behaviour relation. For Ivax respondents, the openness-intentions relation was mediated by both attitude and PBC; openness moderated the subjective norm-intentions relation with subjective norm being a stronger predictor of intentions under low than moderate or high levels of openness; and neuroticism moderated the PBC-intentions relation with PBC being a stronger predictor of intentions under low than moderate or high levels of neuroticism. For Arvin respondents, agreeableness moderated the attitude-intentions relation with attitude being a significant positive predictor of intentions for people with high levels of agreeableness but a non-significant negative predictor of intentions for people with low levels of agreeableness; and neuroticism moderated the subjective norm-intentions relation with subjective norm being a stronger predictor of intentions under low than moderate or high levels of neuroticism. No clear pattern emerges regarding the moderating role of personality within the TPB predictor-intentions relations.

[73] As noted in Section 2.5.2.3, to keep the research focused and the data collection tool sufficiently parsimonious to make it feasible to have it completed by a reasonable number of people, a number of candidate variables were excluded from the current research.

9.3. Contribution of study to understanding Lean and LBs

Despite the fact that authors such as Womack et al. (1990), Radnor et al. (2006, 2008) and Feld (2000) have highlighted the importance of employee motivation for successful Lean implementation, scant research has explored this area in any depth. The current study makes a significant contribution to the Lean literature by exploring employee motivation for Lean through the collection of qualitative and quantitative data from employees in four organisations initiating Lean change. Overall, employees tended to hold positive beliefs about adopting LBs and could see the benefits both for themselves and for their organisations, an encouraging finding for organisations considering a Lean initiative. There was some variation between employees in the different organisations in their expression and endorsement of the beliefs, and this could often be interpreted in light of the organisation's underlying motivation for implementing Lean. It is therefore important to consider the context in which an organisation implements Lean in order to understand the varying beliefs of employees.

Through a comprehensive review of the Lean literature, the researcher identified the most common employee behaviours that are encouraged in organisations implementing Lean. 20 behaviours were incorporated into a scale of LBs that was completed by a total of 1030 employees. The Cronbach alpha values for the scale were consistently high (ranging from 0.89 to 0.94), suggesting that it is an extremely reliable and robust measure of LBs. The current research is the first to develop and pilot a measure of LBs and hence makes a significant contribution to our understanding of what constitutes 'Lean behaviour' and how it can be measured.

Continuous improvement is an important aspect of Lean and is one of the five Lean principles defined by Womack and Jones (1996). The current research bridges an important research gap in the Lean literature, namely identifying the key individual-level factors that determine the willingness of employees to adopt a number of behaviours that support a culture of continuous improvement.

PBC emerged as the strongest predictor of employee intentions to adopt LBs with all four samples. This suggests that employee beliefs about their ability to adopt LBs as

determined by external factors such as access to necessary resources, the cooperation of colleagues and opportunities, are likely to be important irrespective of the type of organisation, or the context, in which Lean is introduced. Lean implementations are unlikely to be embraced by employees unless they are reassured that appropriate resources and opportunities are in place that will facilitate their adoption of LBs.

Past behaviour was a strong independent predictor of future employee engagement in LBs. An organisation implementing Lean will need to consider the behaviours that their employees currently perform in order to determine the degree of behavioural change required. For organisations with employees who are already engaging in LBs to a reasonable extent, the transition to Lean from an employee behavioural perspective is likely to be much quicker.

The mean past behaviour scores suggest that employees in each of the organisations were performing LBs a reasonable amount at the time of the first survey. This could be indicative of the Lean readiness of organisations that chose to embark on a Lean change programme. Perhaps organisations initiating Lean change already have employees familiar with Lean working practices and are simply looking for greater engagement in LBs among their staff.

9.4. Practical Implications

Tranfield and Starkey (1998) argue that management research should adopt a dual approach to knowledge production that addresses both theory and practice. This section will explore the practical implications of the findings for organisations implementing Lean, specifically in terms of designing work environments, communication, training and the use of personality inventories for recruitment.

Although regression analyses of the CU and Ivax datasets suggested that intentions did not significantly independently predict Time 2 behaviour, intentions did have a medium effect on the behaviour of CU respondents and a small-to-medium effect on the behaviour of Ivax respondents. Coupling this with the fact that the Time 2 sample sizes were moderately small, it is possible that intentions are a significant

independent predictor of future employee engagement in LBs. Therefore, potential interventions to manage the variables that significantly predicted employee intentions to adopt LBs (namely attitudes, PBC and subjective norm) will be considered. A meta-analysis of 47 experimental tests of intentions-behaviour relations showed that a medium-to-large change in intentions ($d = 0.66$) can cause a small-to-medium change in behaviour ($d = 0.36$) (Webb & Sheeran, 2006), so changing employee intentions to adopt LBs could potentially change their future engagement in LBs.

9.4.1. Designing Work Environments

Of all the variables measured in the current study, past employee engagement in LBs emerged overall as the strongest predictor of Time 2 employee engagement in LBs. Past behaviour had a direct impact on future behaviour, independent of the TPB constructs, which suggests that employee engagement in LBs could be under the control of habitual responses and that LBs could have a habitual element to them (Ouellette & Wood, 1998). The fact that habits generally depend upon environmental cues and stimuli suggests a point of intervention. Disrupting the environmental context that triggers and maintains habits renders habits open to change (Verplanken & Wood, 2006). Empirical evidence suggests that alterations in the immediate performance environment can lead to changes in habitual behaviour (Heatherton & Nichols, 1994; Wood, Tam & Guerrero-Wit, 2005). Although beyond the scope of the current study, future research should identify the organisational cues and stimuli that instigate employee engagement in Lean and non-LBs so that organisations implementing Lean are aware of how their working environments should be designed to encourage habitual performance of LBs.

Naturally occurring periods of change (such as organisational mergers or acquisitions) provide ideal opportunities to change environmental contexts because the stimuli/cues that instigate habitual behaviour are usually altered (Verplanken & Wood, 2006). Organisations seeking greater habitual employee engagement in LBs would benefit from introducing Lean during such periods of change.

Positive reinforcements or rewards increase the likelihood of a response reoccurring (Skinner, 1953), and adopting and repeating a new behaviour is highly dependent upon people's judgements that the outcome it affords is more favourable than the outcomes offered by alternative behaviours (Rothman, 2000). Organisations implementing Lean should ensure that employees receive valued and timely rewards for performing LBs (for example, financial rewards for implemented improvement suggestions). Verplanken and Wood (2006) argue that successful interventions to change old and develop new habits should establish incentives that encourage new behaviours.

According to Ouellette and Wood (1998, p. 70), strategies that "impede performance of established behaviour while facilitating formation of new behaviours into habits" are particularly effective in changing habitual behaviours. Introducing policies and procedures that hamper engagement in non-LBs while endorsing engagement in LBs could prove fertile. For example, policies that encourage employees to apply the 5 'whys' problem-solving tool (ask why five or more times) before consulting their manager or to offer at least one suggestion every month for a new way of working in their work area. According to Wood, Neal and Quinn (in Verplanken & Wood, 2006), when people repeat behaviours, habits can form naturally as environment-response associations gradually develop in memory. The implementation of such policies and procedures may be sufficient to initiate and subsequently maintain habitual engagement in LBs.

LSE predicted Time 2 employee engagement in LBs. Parker (1998) argues that employees are likely to feel confident about adopting a proactive role if they are given opportunities to make autonomous decisions, use their abilities and work on challenging tasks. Axtell and Parker (2003) provide evidence that active participation in improvement activities and work design that involves decision-making influence and control enhance RBSE. Participating in a process improvement initiative can also change people's attitudes towards the concept and prepare them for a future culture of CI (Radnor et al., 2006). It is therefore crucial that organisations design their work environments to be conducive to Lean ways of working, for example, by introducing improvement groups and affording employees greater responsibility and decision-making. These work design characteristics are likely to increase personal

control and motivate people to exercise their full potential, factors which are vital for building self-efficacy (Bandura, 1986; Bandura & Wood, 1989).

Greater past engagement in LBs was associated with more positive attitudes towards, and stronger intentions to, adopt LBs in the future, and greater LSE. These findings have implications for recruitment. Applicants could complete a measure of LBs similar to the one used in the current study to determine their past exposure to Lean ways of working and hence the likelihood that they will respond favourably to Lean.

9.4.2. Communication

So-called 'downstream interventions' to change people's beliefs and intentions, typically in the form of communication/information, are by themselves unlikely to change habitual behaviours (Verplanken & Wood, 2006). Yet coupling such interventions with disruptions to the environmental context, as described above, an intervention known as 'downstream-plus-context-change', can lead to successful behavioural change. Verplanken and Wood (2006) argue that the "the information-processing mind-sets that accompany strong habits and the automatic cuing of habits by the environment hinder the effectiveness of typical downstream interventions that involve solely informational campaigns or self-regulation. However, greater success is likely when such downstream strategies are paired with naturally occurring lifestyle changes. Downstream-plus-context-change interventions gain their effectiveness because changes in context render people with strong habits vulnerable to new information. Specifically, environmental changes that disrupt habits also challenge habitual mind-sets and thus increase openness to new information and experiences. Furthermore, because these environmental changes impair the automatic cuing of well-practiced responses, they enable performance of new actions" (p. 96). They further add that downstream-plus-context-change interventions are particularly effective when context changes apply to groups of people, and hence they could be appropriate for changing the behaviour of large groups of employees. Cleary, there is value in considering how communication and information could be used to encourage greater employee adoption of LBs.

According to Ajzen (1991, 2005), addressing the behavioural, normative and control beliefs underlying attitudes, subjective norms and PBC or introducing new beliefs should produce changes in intentions and subsequently changes in behaviour (given reasonable control over the behaviour). Despite offering insight into the role of beliefs in influencing behaviour and how such beliefs can be identified, the TPB is silent with regard to *how* beliefs underlying a given behaviour can or should be changed (Hardeman et al., 2002; Hobbis & Sutton, 2005). The Elaboration Likelihood Model (ELM) of persuasion (Petty & Cacioppo, 1986b) addresses this weakness with regard to attitudes by explaining the processes by which attitude and belief change occur (Ajzen & Manstead, 2007; Beale & Bonsall, 2007).

The ELM is an information-processing model of attitude change. It states that there are two distinct routes to persuasion, a superficial (peripheral) route and a systematic (central) route. The superficial route is an effortless approach to information processing in which simple inferences about the attitude object or behaviour are made using heuristics (such as the credibility of the person presenting the arguments). The systematic route, by contrast, is a cognitively demanding process involving critical evaluation, deliberation and judgement of the strength and quality of the presented arguments. Due to the cognitive activity at encoding, systematically altered attitudes become more embedded in memory, are more persistent and resistant, and lead to greater recipient allegiance than attitudes changed via the peripheral route (Chaiken, 1980; Haugtvedt & Petty, 1992). Compelling empirical evidence supports the presence of these two persuasion routes (see Petty, Wegener & Fabrigar, 1997, for a review). Sustainable employee engagement in LBs is desired by most organisations implementing Lean (Hines, Found, Griffiths & Harrison, 2008) and hence the systematic route to persuasion is the most appropriate route. People are likely to be motivated to invest the cognitive effort necessary for systematic processing if they perceive the presented arguments to be strong, of high quality and self-relevant (Petty & Cacioppo, 1986b).

The current research shows that more positive attitudes towards adopting LBs were generally reported by employees who believed that doing so would increase company profits and productivity, help employees to work smarter/more efficiently, increase their work motivation, improve the quality of products, improve

communication, reduce the amount of work in progress, create a more efficient production process/improve company efficiency, improve/streamline processes/procedures, not make their job more stressful and not contribute to their site closing. Compared to non-intenders, intenders generally reported the positive beliefs more strongly and the negative beliefs more weakly. To systematically alter employee attitudes and subsequent intentions in favour of Lean, organisations should present employees with strong, high-quality arguments that directly address these underlying beliefs, and demonstrate to them how their performance of LBs can lead to these positive outcomes. Presenting examples of the mechanisms by which Lean has led to positive outcomes in other organisations applying Lean could be effective. Employee participation in simulation games or value stream mapping exercises could also help reshape beliefs (Emiliani, 2004b; Forssen & Haho, 2001). To increase motivation for cognitive processing, all presented arguments and simulation/mapping activities need to directly relate to the target audience and draw upon their past experiences, values and aspirations.

Empirical evidence shows that the presentation of persuasive arguments directed at underlying beliefs can cause people to develop new, readily accessible beliefs that are persistent and strong predictors of behaviour (Cacioppo, Petty, Kao & Rodriguez, 1986; Chaiken, 1980; Drolet & Aaker, 2002; Haugtvedt & Petty, 1992; McGuire, 1985; Petty and Cacioppo, 1986a). Radnor et al. (2006) recognise the importance of addressing employee beliefs and expectations for effective Lean implementation, and a number of other authors stress the importance of communication for successful Lean implementation (Jenner, 1998; Spear & Bowen, 1999; Storch & Lim, 1999; Tracey & Flinchbaugh, 2006; Womack et al., 1990; Worley & Doolen, 2006).

Overall, compared to non-intenders, intenders were significantly more likely to report that their manager/supervisor would approve of their adoption of LBs. This highlights the importance of management acceptance for employee acceptance, and the value of having a management team that it seen to support the Lean initiative, a view endorsed by other authors (Radnor et al., 2006; Worley & Doolen, 2006). Management support communicates to employees that they value employee engagement in the target behaviours, and can influence positively employee perceptions and attitudes (Leibowitz, Farren & Kaye, 1983). Evidence also suggests

that employees who perceive their manager to support a change programme are significantly more likely to participate in the change process (Antoni, 2004). Ensuring that managers are presented with strong, high quality, self-relevant arguments in favour of adopting LBs is therefore crucial.

The Lean communication should initially be delivered by a member of senior management to demonstrate top management sponsorship and then continually reinforced by lower level managers to employees across the organisation to ensure company-wide awareness, acceptance and engagement. Many authors recognise the importance of targeting communication about Lean and Lean-type initiatives at all levels of employees (Banker, Potter & Schroeder, 1993; Bessant et al., 2003; Guimaraes, 1999; Shadur et al., 1995; Taylor & Wright, 2003).

In addition to delivering the Lean message, communication can have important secondary consequences. Radnor et al. (2006) argue that good communication during a Lean implementation has many benefits including enhanced employee motivation, maintenance of the momentum of change, cross-departmental knowledge-sharing and employee effort recognition. Other authors have shown communication to enhance job satisfaction, organisational commitment and RBSE (Parker, 1998; Rodwell, Kienzle & Shadur, 1998). Mechanisms to increase these variables should be employed because the current study suggested that they were significant predictors of future employee engagement in LBs.

The higher employees' PBC with respect to adopting LBs, the stronger were their intentions to engage in LBs. PBC reflects beliefs about how easy or difficult it would be to perform the behaviour. According to Dawkins and Frass (2005), "workers' perceptions of behavioural control identify the degree to which workers trust management to facilitate successful changes in the workplace" (p. 525). The Lean communication should convey to employees that they can trust the organisation and management to provide employees with adequate opportunities, resources, training and operational support to assist in their performance of LBs.

9.4.3. Training

LSE was a significant predictor of future employee engagement in LBs. Training could be used to enhance LSE levels and subsequently employee adoption of LBs. Observing individuals who demonstrate effective strategies for successful task performance can prompt behavioural modelling by generating self-efficacy beliefs in observers that they, too, could perform the behaviour if they employed similar strategies (Bandura, 1977). Providing people with opportunities to engage in the target behaviours and achieve personal mastery through the setting and achieving of sub-goals is also powerful (Bandura, 1977). To enhance LSE levels, employees with minimal engagement in LBs should observe their more experienced colleagues engaging in LBs and be given opportunities on-the-job to model their behaviour and to set and achieve sub-goals under the guidance and supervision of colleagues. The idea of providing employees with opportunities that encourage performance of the desired behaviours is consistent with Verplanken and Wood's (2006) arguments concerning the changing of old habits and the establishment of new ones. Training and development are also consistent with the Lean approach to management (Kabst, Larsen & Bramming, 1996).

Empirical evidence suggests that training significantly enhances the self-efficacy beliefs of employee (Chou, 2001; Frayne & Latham, 1987; Gist, 1989; Gist et al., 1989). Longitudinal research demonstrates that training involving interpersonal skills (such as team-working) or proactive technical mastery (such as total preventative maintenance) enhances people's confidence to accept a Leaner, more proactive and interpersonal role within the workplace (Axtell & Parker, 2003).

Before employees can feel confident about adopting LBs, they need to be fully aware of the Lean philosophy, and the skills and abilities required of them to successfully perform in a Lean environment. Employees at all levels should receive comprehensive training on the background to Lean so that they understand the rationale for the changes, the benefits Lean can offer them and the organisation, and what is expected of them. Radnor and Walley (2008) argue that "Everyone in the organization needs to be trained in the Lean philosophy concepts, as well as the planning, design, implementation and evaluation of the changes" (p. 14).

Participation in simulation games could enhance employee understanding of Lean and help instil beliefs that Lean can lead to outcomes such as reduced work in progress, increased efficiency, and improved quality (Forssen & Haho, 2001).

The importance of training and workforce development for successful implementation of promising practices has been duly emphasized (Ahire & Ravichandran, 2001; Guimaraes, 1999; Kassicieh & Yourstone, 1998; Leseure et al., 2004; MacDuffie, 1995; McLachlin, 1997; Monden, 1983; Motwani, 2003; Radnor et al., 2006; Womack et al., 1990). Radnor and Boaden (2004) reported that training provision was used by senior management at Nortel to encourage employees to assume a Leaner approach to their work.

In addition to addressing LSE beliefs, training can enhance job satisfaction, organisational commitment, motivation and employee engagement (Ayres & Malouff, 2007; Bartlett, 2001; Georgellis & Lange, 2007; Kappelman & Prybutok, 1995; McDonald, Siegall & Morris, 1993; McLachlin, 1997; Niepce & Molleman, 1998; Nordhaug, 1989). Enhancing self-efficacy beliefs through training is also likely to create more positive attitudes towards adopting Lean behaviours because individuals who feel confident in their ability to engage in particular behaviours tend to have more positive attitudes towards adoption of those behaviours (Bandura, 1982; Thoms et al., 1996). Training could enhance employees' perceptions of control. By providing training, management is demonstrating its commitment to providing employees with the resources and opportunities to support their adoption of LBs.

9.4.4. Personality Inventories

For the larger Ivax sample, the lower employees scored on neuroticism, the more likely they were to engage in LBs at Time 2; conscientiousness, openness and extraversion were significantly positively correlated with past engagement in LBs; and all five personality traits were significantly correlated with LSE. Openness was consistently a significant independent predictor of LSE and personality was significantly related to employee attitudes towards adopting LBs. These findings carry important implications for organisations implementing Lean regarding the use of personality inventories for recruitment.

During the past 20 years, personality instruments have become increasingly popular in personnel selection (Tett & Christiansen, 2007). A number of personality inventories have been developed that are readily used by organisations for recruitment, including the NEO Personality Inventory (Costa & McCrae, 1992), the California Psychological Inventory (Gough, 1987), the 16PF (Cattell et al., 1970) and the Hogan Personality Inventory (Hogan & Hogan, 1992). The rationale for their widespread use is the mounting research indicating that personality can accurately predict job performance (Barrick & Mount, 1991; Barrick et al., 2001; Hurtz & Donovan, 2000; Salgado, 2003; Tett et al., 1991). Presumably this is one of the reasons Toyota (UK) has relied heavily on psychometric tests for recruiting new staff (Winfield, 1994; Winfield & Kerrin, 1994).

Organisations could use personality inventories as part of their selection procedure to ensure the recruitment of people who are positively disposed to adopting a more proactive, autonomous role within the workplace and who are likely to feel confident engaging in the various LBs. Personality has also been linked to people's motivation to learn (Colquitt & Simmering, 1998; Colquitt et al., 2000; Martocchio & Judge, 1997). Personality inventories could be used to help secure a workforce that is motivated to develop the skills necessary for engagement in LBs. These recommendations align with Radnor et al.'s (2006) arguments that "For successful implementation Lean practice implies a pre requisite is having the right employee in the right position" (p. 98) and that "a critical mass of people who are comfortable working with Lean practices is required" (p. 3).

Organisations should, however, use personality inventories cautiously. Candidates can sometimes fake their responses to appear more appropriate for the job (Morgeson, Campion, Dipboye, Hollenbeck, Murphy & Schmitt, 2007; Rosse, Stecher, Miller, & Levin, 1998; Tett & Christiansen, 2007). Using personality inventories alongside traditional recruitment methods such as interviews and references should increase the chances of employing someone with the appropriate 'Lean personality'.

9.5. Limitations and Suggestions for Future Research

The current study has addressed some important research gaps in a largely neglected but critical area of Lean. There are nevertheless some limitations of the study which warrant discussion. This section will explore these limitations and suggest how they could be overcome in future studies into employee motivation for Lean.

The Time 2 sample sizes were moderately small and this could explain why intentions and PBC failed to emerge as significant independent predictors of Time 2 behaviour. The sample sizes were largely dependent upon the size of the target samples in the participating organisations and, as noted in Section 3.4, there were good reasons for selecting these organisations for the study. Replicating the study in organisations with larger potential samples would likely lead to larger sample sizes and allow further tests of the TPB's ability to predict employee engagement in LBs.

The time delay between administering the two questionnaires, which may have resulted in changes in intentions and PBC, could explain why intentions and PBC failed to significantly predict Time 2 behaviour. As discussed in Section 3.5.2, there were valid reasons for selecting an inter-questionnaire time period targeted at 6 months. Although future studies could employ a shorter time period, there is the risk that asking employees to complete two questionnaires close together could compromise Time 2 response rates, and that a time period considerably shorter than 6 months may not be sufficient for many of the LBs to be carried out. It would, however, still be interesting to see whether, as past research suggests (Sheeran & Orbell, 1998a), a shorter inter-questionnaire time interval leads to stronger intentions-behaviour and PBC-behaviour correlations with regards to LBs.

Several factors informed the researcher's decision to use a self-report measure of Time 2 behaviour (see Section 3.5.2.2). However, intentions and PBC tend to explain more variance in self-reported behaviour than in objectively assessed behaviour, perhaps because of greater correspondence between TPB measures and self-report measures in terms of action, target, context and timeframe (Armitage & Conner, 2001a; Elliott, Armitage & Baughan, 2007). If an objective measure of LBs had been used, intentions and PBC may have explained even less variance in Time 2

behaviour. Although requiring a more complex research design and greater resources both from the researcher and the organisations, future research could couple a self-report LBs measure with a more objective measure (such as colleague/manager ratings) to determine the effect of the behaviour measure on the findings. The results of such a study would, however, need to be interpreted cautiously because colleague/manager ratings could be influenced by a self-presentation bias (i.e., employees engaging in LBs more when they are being observed to appear consistent with organisational objectives).

Control belief data (the perceived frequency of occurrence and power of factors that could either facilitate or inhibit performance of LBs) were not collected in the current study because this would have lengthened the questionnaire and possibly reduced response rates. It was therefore not possible to establish which control beliefs underlying employee's PBC to target in communication campaigns aimed at enhancing PBC. Future studies could identify the salient control beliefs by including some questions in the interviews/focus groups relating to facilitators/inhibitors of engaging in LBs. This data could then be fed into the Time 1 questionnaire.

Gollwitzer (1990) argues that forming 'implementation intentions' is a more powerful self-regulatory mechanism to promote the initiation of goal-directed behaviours than simply forming intentions. Transforming the desired goal state from a higher to a lower level of abstractness (Vallacher & Wegner, 1987), implementation intentions link anticipated future situations (opportunities) to particular goal-directed behaviours and help commit the individual to performing the target behaviours when the critical situation is encountered. They usually take the form of "I intend to do x when situation y is encountered" and in a Lean context could be "I intend to engage in LBs when I encounter a problem with my work" or "I intend to engage in LBs when I can see that doing something differently would enhance organisational performance". Empirical research suggests that forming implementation intentions leads to greater translation of intentions to actions than forming behavioural intentions alone (Elliott & Armitage, 2006; Gollwitzer & Brandstatter, 1997; Gollwitzer & Sheeran, 2006; Orbell, Hodgkins & Sheeran, 1997; Sheeran, 2002; Sheeran & Orbell, 1998b, 2000). Future research could include a

measure of implementation intentions to adopt LBs to determine whether this bridges the intentions-behaviour gap.

Past behaviour was measured as the frequency with which employees currently engaged in 20 LBs on a scale ranging from 'not at all' to 'a great deal'. Although measures of past behaviour and habit have often used the same wording in TPB research (Conner & Armitage, 1998), Verplanken and Orbell (2003) argue that past behavioural frequency alone is not a measure of habit. Although behavioural repetition is necessary for habit formation, not all repeated behaviours are automatically cued by the environment, and measures of habit should therefore be distinguished from measures of behavioural frequency. To address this issue, Verplanken and Orbell (2003) developed a 12-item index of habit strength (incorporating measures of repetition, automaticity and awareness) which subsequent research has shown to predict intentions above and beyond past behaviour (Honkanen, Olsen & Verplanken, 2005). Future studies could usefully include this measure of habit to explicitly investigate the role of habit in predicting employee engagement in LBs.

The finding that a weighted average of 57.4% of the variance in intentions was explained by the TPB predictors across the four samples means that 42.6% of the variance in intentions remains unexplained. Although some of this variance may be due to methodological factors (Ajzen, 2002; Ajzen & Fishbein, 2004; Sheeran & Abraham, 2003; Sutton, 1998), some is likely to be attributable to non-TPB variables. The Ivax and CU results suggested that the non-TPB variables measured in the current study explained a negligible amount of the variance in intentions. Future studies could include some additional non-TPB variables that have been shown to predict intentions such as affect (Lawton et al., 1997, 2007; Trafimow et al., 2004), self-identity (Armitage & Conner, 2001b; Conner & Armitage, 1998; Conner, Warren, Close & Sparks, 1999; Sparks & Shepherd, 1992; Terry, et al., 1999), moral norms (Armitage et al., 2001a; Conner & Armitage, 1998; Conner, Smith & McMillan, 2003; Manstead, 2000; McMillan et al., 2005), anticipated regret (Conner & Abraham, 2001; Conner, Graham & Moore, 1999), and perceived susceptibility (Milne et al., 2000; Orbell & Sheeran, 1998). Inclusion of some of these variables

would also shed some light on whether they mediate the relation between past and future employee engagement in LBs.

Cialdini, Kallgren and Reno (1991) distinguish between injunctive norms and descriptive norms. Injunctive norms are similar to the subjective norm construct in the TPB and refer to an individual's perceptions of what significant others think the individual should do. Descriptive norms, in contrast, reflect perceptions of how significant others are actually behaving. Empirical evidence supports this distinction and, more importantly, the direct and independent effect of descriptive norms on intentions (Rivis & Sheeran, 2003; Sheeran & Orbell, 1999). An employee's ability to perform behaviours such as teamworking and job rotation is dependent upon the behaviour of colleagues, and some of the LBs (contributing to discussions about company's goals, and visiting people from other departments to suggest doing things differently) have a social element to them and may, through a social conformity mechanism, be influenced by the behaviour of colleagues. Descriptive norms could be a determinant of employee intentions to adopt LBs and future studies would benefit from including a measure of descriptive norms.

The results suggested an overwhelming tendency for employees in the four participating organisations to hold positive beliefs about, and to have positive attitudes towards, adopting LBs. Although no previous research has systematically explored employee beliefs about, and attitudes towards, performing LBs, a number of researchers have argued that employees tend to react negatively to Lean (Benders, 1996; Berggren, 1993; Delbridge, 1995, 1998; Ezzamel et al., 2001; Grönning, 1995; Radnor et al. 2006; Rehder, 1994). An explanation for this seeming discrepancy could be that, despite the researcher emphasising to the organisational contacts that the questionnaire was relevant to the whole target population, people more positively disposed to Lean may have been more inclined to invest the time and effort required to complete the rather lengthy Time 1 questionnaire. Interest in the questionnaire topic is linked to a respondents' likelihood of completing the questionnaire (Groves, Presser & Dipko, 2004) and possibly even their attitudinal standing on the questionnaire topic (Rogelberg & Stanton, 2007). Biased samples are a huge problem in organisational research and cannot always be avoided. However, if organisations in future studies invited the whole target population to a meeting in which they were

allocated time to complete the questionnaire, then this may partially address this problem.

A self-presentation bias could also explain this seeming inconsistency (Paulhus, 1984). Despite guaranteeing anonymity, questionnaire respondents may have distorted some of their responses to appear more favourable towards Lean than they in fact were. Future studies could incorporate the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960) to control for this.

To keep the study focused and within resource constraints, the researcher concentrated solely on the individual-level predictors of employee engagement in LBs. Yet behaviour is both individually and environmentally driven (Bandura, 1997; Hogan, 2005). The employee resistance to Lean reported by so many authors could be due to factors external to the individual. For a richer understanding of employee behaviour within a Lean context, future research could explore the interactions between employees and organisational variables such as those contained in Radnor's "organisational diamond" (strategy, process and technology) (cited in Radnor & Boaden, 2004). The importance of considering these organisational facets in addition to people when implementing change has been widely recognised (Hines, Found, Griffiths & Harrison, 2008; Johnson, 2004; Kettinger & Grover, 1995; Leavitt, 1965; Radnor et al., 2006) and some authors (Hines et al., 2008; Johnson, 2004; Kettinger & Grover, 1995) even argue that leadership should be included as a fifth facet. Organisational culture also warrants consideration because it establishes the norms for employee behaviour and is vital for successful implementation of the Lean philosophy (Radnor et al., 2006; Radnor & Walley, 2008). The socio-economic and political environment in which the organisation is embedded should also be borne in mind (Radnor, 2000).

Due to resource and time constraints and issues concerning organisational access, the study was only conducted in four organisations, all of which defined themselves as being in the early stages of their Lean implementations. Furthermore, for reasons beyond the researcher's control (see Section 7.3), interview/focus group and personality data could not be collected from CU staff. To establish the generalisability of the findings, the study should be replicated using interviews/focus

groups and the complete Time 1 questionnaire (see Appendix A) in more organisations implementing Lean, in both the manufacturing and service sectors. Studying employees in organisations more advanced in their Lean implementations would also shed light on whether employee beliefs, attitudes and perceptions regarding their adoption of LBs vary as a function of the maturity of the Lean implementation within the organisation. It would be useful to repeat the study with employees working in healthcare, local government and public services in general, given recent successful applications of Lean to these sectors (Kollberg et al., 2007; Krings et al., 2006; Massey et al., 2005; Radnor et al., 2006).

Although the TPB is considered a causal model of behaviour, most TPB studies employ correlational designs (similar to that used in the current study) which enable only weak causal inferences between attitudes, PBC, subjective norms and intentions to be drawn (Sutton, 2002). As Conner (2005) argues, a fertile direction for future research would be to manipulate one of the TPB constructs and measure the effects on intentions, while ensuring that the manipulation does not change other constructs it was not intended to change; for example, researchers could assess whether communication which addresses employees' underlying behavioural beliefs about adopting LBs impacts on their attitudes and intentions. Such experiments would allow a robust test of the causal assumptions of the TPB with respect to employee engagement in LBs. They would also shed some light on the effectiveness of interventions such as communication on encouraging employee adoption of LBs.

To conclude, there are several, but justifiable, limitations of the current study which should be borne in mind when interpreting the findings. A number of ways in which future research could address these limitations have been identified. To ensure future questionnaires exploring employee motivation for Lean remain parsimonious and of a reasonable length to entice participation from a large number of employees, only a subset of these recommendations should be incorporated into a single study.

9.6. Overall Conclusions

To summarise, the current study has addressed a much neglected but critical area of Lean. Using Ajzen's (1991) TPB model as the core theoretical framework, it has explored employee beliefs about adopting LBs, and the individual-level antecedents of employee intentions to adopt, and their future engagement in, LBs. The results suggest that employees generally hold positive beliefs concerning their adoption of LBs and perceive that doing so could enhance their work experiences and the prosperity of the organisation. The TPB performs well with regard to employee intentions to adopt LBs but has limited ability to predict employee engagement in LBs. Past employee engagement in LBs consistently emerged as a strong predictor of future employee engagement in LBs. The findings have important practical implications for organisations implementing Lean in terms of designing work environments, communication, training, and the use of personality inventories for recruitment. Future research should address some of the identified limitations of the current study to add to the limited literature on what drives employees to adopt the proactive and autonomous behaviours that support the Lean philosophy.

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Appendix A: Rizla Time 1 Questionnaire

1. The following statements concern how satisfied you are with different aspects of your job. Using the scale below, please circle ONE number for EACH statement.

0	1	2	3	4	5	6
Extremely dissatisfied	Very dissatisfied	Quite dissatisfied	Neither satisfied nor dissatisfied	Quite satisfied	Very satisfied	Extremely satisfied

The physical working conditions	0	1	2	3	4	5	6
The freedom to choose your own method of working	0	1	2	3	4	5	6
The people you work with	0	1	2	3	4	5	6
The recognition you get for good work	0	1	2	3	4	5	6
Your immediate boss	0	1	2	3	4	5	6
The amount of responsibility you are given	0	1	2	3	4	5	6
Your rate of pay	0	1	2	3	4	5	6
The opportunity to use your abilities	0	1	2	3	4	5	6
Industrial relations between management and workers in your firm	0	1	2	3	4	5	6
Your chance of promotion	0	1	2	3	4	5	6
The way your organisation is managed	0	1	2	3	4	5	6
The attention made to suggestions you make	0	1	2	3	4	5	6
Your hours of work	0	1	2	3	4	5	6
The amount of variety in your job	0	1	2	3	4	5	6
Your job security	0	1	2	3	4	5	6
The opportunity to learn and develop new skills	0	1	2	3	4	5	6
Your work performance	0	1	2	3	4	5	6
Your workload	0	1	2	3	4	5	6
The opportunity to give opinions about how your work is carried out	0	1	2	3	4	5	6
Considering everything, how do you feel about your job as a whole?	0	1	2	3	4	5	6

2. The following statements concern how you feel about your organisation. Using the scale below, please circle ONE number for EACH statement.

0	1	2	3	4
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

I am willing to put in a lot of effort beyond that normally expected to help this organisation be successful	0	1	2	3	4
I talk up this organisation to my friends as a great organisation to work for	0	1	2	3	4
I feel very little loyalty to this organisation	0	1	2	3	4
I would accept almost any type of job assignment in order to keep working for this organisation	0	1	2	3	4
I find that my values and this organisation 's values are very similar	0	1	2	3	4
I am proud to tell others that I am part of this organisation	0	1	2	3	4
I could just as well be working for a different organisation as long as the type of work was similar	0	1	2	3	4
This organisation really inspires the very best of me in the way of job performance	0	1	2	3	4
It would take very little change in my present circumstances to cause me to leave this organisation	0	1	2	3	4
I am extremely glad that I chose this organisation to work for over others I was considering at the time I joined	0	1	2	3	4
There's not much to be gained by sticking with this organisation forever	0	1	2	3	4
Often, I find it difficult to agree with this organisation 's policies on important matters relating to its employees	0	1	2	3	4
I really care about what happens to this organisation	0	1	2	3	4
For me, this is the best of all possible organisations for which to work	0	1	2	3	4
Deciding to work for this organisation was a definite mistake on my part	0	1	2	3	4

3. Using the scale below, please circle ONE number for EACH statement to indicate the extent to which you currently engage in the following behaviours at your organisation.

0	1	2	3	4
Not at all	Just a little	A reasonable amount	Quite a lot	A great deal

Rotate jobs and tasks with your colleagues	0	1	2	3	4
Train colleagues	0	1	2	3	4
Decide how to go about getting your job done	0	1	2	3	4
Plan your own work	0	1	2	3	4
Use a variety of skills and abilities in your job	0	1	2	3	4
Use your initiative in your job	0	1	2	3	4
Take part in decisions that are likely to affect you in your job	0	1	2	3	4
Take part in activities aimed at improving the working of your section	0	1	2	3	4
Decide on the order in which you do things	0	1	2	3	4
Analyse a long-term problem to find a solution	0	1	2	3	4
Suggest new ways of working in your work area	0	1	2	3	4
Make suggestions to management about ways to improve the working of your section	0	1	2	3	4
Contribute to discussions about your company's strategy	0	1	2	3	4
Help to set targets/goals in your work area	0	1	2	3	4
Visit people from other departments to suggest doing things differently	0	1	2	3	4
Work as part of a team	0	1	2	3	4
Keep your work area neat, tidy and safe	0	1	2	3	4
Represent your work area in meetings with senior management	0	1	2	3	4
Design new procedures for your work area	0	1	2	3	4
Present information to a group of colleagues	0	1	2	3	4

4. People working in Lean organisations normally adopt the following behaviours. How confident would you feel adopting these behaviours <u>at your organisation in the next 6 months</u>?

0	1	2	3	4
Not at all confident	A little confident	Reasonably confident	Quite confident	Very confident

Rotating jobs and tasks with your colleagues	0	1	2	3	4
Training colleagues	0	1	2	3	4
Deciding how to go about getting your job done	0	1	2	3	4
Planning your own work	0	1	2	3	4
Using a variety of skills and abilities in your job	0	1	2	3	4
Using your initiative in your job	0	1	2	3	4
Taking part in decisions that are likely to affect you in your job	0	1	2	3	4
Taking part in activities aimed at improving the working of your section	0	1	2	3	4
Deciding on the order in which you do things	0	1	2	3	4
Analysing a long-term problem to find a solution	0	1	2	3	4
Suggesting new ways of working in your work area	0	1	2	3	4
Making suggestions to management about ways to improve the working of your section	0	1	2	3	4
Contributing to discussions about your company's strategy	0	1	2	3	4
Helping to set targets/goals in your work area	0	1	2	3	4
Visiting people from other departments to suggest doing things differently	0	1	2	3	4
Working as part of a team	0	1	2	3	4
Keeping your work area neat, tidy and safe	0	1	2	3	4
Representing your work area in meetings with senior management	0	1	2	3	4
Designing new procedures for your work area	0	1	2	3	4
Presenting information to a group of colleagues	0	1	2	3	4

5. Using the scale below, please circle ONE number for EACH statement to indicate how much you feel that your adopting Lean behaviours (i.e., adopting the behaviours in Question 4) at your company in the next 6 months would lead to each of the following outcomes.

-3 Extremely unlikely	-2 Quite unlikely	-1 Slightly unlikely	0 Neither likely nor unlikely	1 Slightly likely	2 Quite likely	3 Extremely likely

Increase profits at Rizla	-3	-2	-1	0	1	2	3
Boost morale at Rizla	-3	-2	-1	0	1	2	3
Contribute to job losses at Rizla	-3	-2	-1	0	1	2	3
Improve quality of Rizla products	-3	-2	-1	0	1	2	3
Make my job more stressful	-3	-2	-1	0	1	2	3
Increase productivity at Rizla	-3	-2	-1	0	1	2	3
Improve communication at Rizla	-3	-2	-1	0	1	2	3
Create a more efficient production process	-3	-2	-1	0	1	2	3
Make my job more interesting	-3	-2	-1	0	1	2	3
Increase my job satisfaction	-3	-2	-1	0	1	2	3
Contribute to this site closing	-3	-2	-1	0	1	2	3
Increase my work motivation	-3	-2	-1	0	1	2	3
Help me to work smarter	-3	-2	-1	0	1	2	3
Make working conditions at Rizla worse	-3	-2	-1	0	1	2	3
Make the working environment at Rizla safer	-3	-2	-1	0	1	2	3
Reduce the amount of work in progress	-3	-2	-1	0	1	2	3
Create space	-3	-2	-1	0	1	2	3

Using the same scale, please indicate your responses to the following:

Most people important to me think that I should adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
My co-workers think that I should adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
My manager/supervisor thinks that I should adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
I usually take account of the opinions of people important to me when deciding how I should work	-3	-2	-1	0	1	2	3
I usually take account of the opinions of my co-workers when deciding how I should work	-3	-2	-1	0	1	2	3
I usually take account of the opinions of my manager/supervisor when deciding how I should work	-3	-2	-1	0	1	2	3
Adopting Lean behaviours at this company in the next 6 months is easy for me to do	-3	-2	-1	0	1	2	3
I feel confident that I can adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
If I wanted to, I could easily adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
There are few barriers to my adopting Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
I can control whether I decide to adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
I intend to adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3
I expect to adopt Lean behaviours at this company in the next 6 months	-3	-2	-1	0	1	2	3

6. Using the scale below, please indicate your evaluations of EACH of the following outcomes.

-3	-2	-1	0	1	2	3
Extremely bad	Quite bad	Slightly bad	Neither bad nor good	Slightly good	Quite good	Extremely good

Increase profits at Rizla	-3	-2	-1	0	1	2	3
Boost morale at Rizla	-3	-2	-1	0	1	2	3
Contribute to job losses at Rizla	-3	-2	-1	0	1	2	3
Improve quality of Rizla products	-3	-2	-1	0	1	2	3
Make my job more stressful	-3	-2	-1	0	1	2	3
Increase productivity at Rizla	-3	-2	-1	0	1	2	3
Improve communication at Rizla	-3	-2	-1	0	1	2	3
Create a more efficient production process	-3	-2	-1	0	1	2	3
Make my job more interesting	-3	-2	-1	0	1	2	3
Increase my job satisfaction	-3	-2	-1	0	1	2	3
Contribute to this site closing	-3	-2	-1	0	1	2	3
Increase my work motivation	-3	-2	-1	0	1	2	3
Help me to work smarter	-3	-2	-1	0	1	2	3
Make working conditions at Rizla worse	-3	-2	-1	0	1	2	3
Make the working environment at Rizla safer	-3	-2	-1	0	1	2	3
Reduce the amount of work in progress	-3	-2	-1	0	1	2	3
Create space	-3	-2	-1	0	1	2	3

7. For EACH of the four scales below, please indicate your overall opinion of your adopting Lean behaviours <u>at this company in the next 6 months.</u>

1	2	3	4	5	6	7
Extremely bad	Bad	Quite bad	Neither bad nor good	Quite good	Good	Extremely good
1	2	3	4	5	6	7
Extremely sensible	Sensible	Quite sensible	Neither sensible nor foolish	Quite foolish	Foolish	Extremely foolish
1	2	3	4	5	6	7
Extremely valuable	Valuable	Quite valuable	Neither valuable nor worthless	Quite worthless	Worthless	Extremely worthless
1	2	3	4	5	6	7
Extremely wrong	Wrong	Quite wrong	Neither wrong nor right	Quite right	Right	Extremely right

8. How long have you worked here? _____ Years

9. Please indicate whether you are currently a manager Manager ☐ Non-manager ☐

10. Are you a member of a union? Yes ☐ No ☐

11. Gender: Male ☐ Female ☐

12. Age: 16-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐

13. Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *prefers work that is routine*? Using the scale below, please circle ONE number for EACH statement to indicate the extent to which you agree or disagree with that statement.

0	1	2	3	4
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

I see myself as someone who...

...prefers work that is routine	0	1	2	3	4
...does things efficiently	0	1	2	3	4
...is a reliable worker	0	1	2	3	4
...tends to be quiet	0	1	2	3	4
...is original, comes up with new ideas	0	1	2	3	4
...remains calm in tense situations	0	1	2	3	4
...is helpful and unselfish with others	0	1	2	3	4
...can be a bit careless	0	1	2	3	4
...is relaxed, handles stress well	0	1	2	3	4
...is interested in many different things	0	1	2	3	4
...keeps at it until the task is finished	0	1	2	3	4
...starts arguments with others	0	1	2	3	4
...does a thorough job	0	1	2	3	4
...can be moody	0	1	2	3	4
...is emotionally stable, not easily upset	0	1	2	3	4
...values artistic experiences	0	1	2	3	4
...has a forgiving nature	0	1	2	3	4
...tends to be disorganized	0	1	2	3	4
...is considerate and kind to almost everyone	0	1	2	3	4
...has an active imagination	0	1	2	3	4
...who knows much about art, music, literature	0	1	2	3	4
...makes plans and follows through with them	0	1	2	3	4
...worries a lot	0	1	2	3	4
...is reserved	0	1	2	3	4
...is self-confident	0	1	2	3	4
...is usually trusting	0	1	2	3	4
...is full of energy	0	1	2	3	4
...is not very interested in art	0	1	2	3	4
...is talkative	0	1	2	3	4
...is outgoing, sociable	0	1	2	3	4
...tends to find fault with others	0	1	2	3	4
...can be tense	0	1	2	3	4
...is sometimes shy, reserved	0	1	2	3	4
...can be cold and unfriendly	0	1	2	3	4
...creates a lot of enthusiasm	0	1	2	3	4
...is a deep thinker	0	1	2	3	4
...is depressed, blue	0	1	2	3	4
...is easily distracted	0	1	2	3	4
...tends to be lazy	0	1	2	3	4
...is sometimes rude to others	0	1	2	3	4
...likes to think, play with ideas	0	1	2	3	4
...likes to cooperate with others	0	1	2	3	4
...gets nervous easily	0	1	2	3	4
...is inventive	0	1	2	3	4

14. Please provide a password that you will easily remember. This will help us to match up your data if you complete a similar questionnaire to this in the future_____

Thank you for completing this questionnaire

Appendix B: Cover Letter for Ivax Time 1 Questionnaire

This survey is being administered by Jo from Cardiff University this Tuesday, Wednesday and Thursday. The Questionnaire being used is tailored for Ivax and was compiled by Jo following a series of meetings she held with individuals and groups of employees in April this year. The purpose of the survey is to identify areas for change and improvement within the organisation including but not limited to your ways of working, job satisfaction and commitment.

Most of the questions simply require you to tick a box. Completion of the questionnaire should only take about 20-25 minutes. Please try to be as honest as you can in your responses so that Ivax gets a true picture of employees' perceptions. **All employees are encouraged to participate.** The more people participate, the more accurate the feedback.

The survey is **completely anonymous**. No names are attached to the document. Feedback will appear in summarised form and will not be attributable to any one person. You are asked, however, to put a password you will easily remember at the end of the questionnaire. This is so that when a similar exercise is repeated in the future, the Cardiff research team can match up your data. **Please ensure you put a password on your questionnaire.**

If you have received this questionnaire by email, please print it out, complete it and return it to Jo.

Questionnaires must be completed and returned to Jo by **Thursday 20th July.**

THE OUTPUT OF THE QUESTIONNAIRE CAN AFFECT HOW CHANGE HAPPENS IN IVAX

YOUR OPINIONS ARE IMPORTANT

PLEASE PARTICIPATE!

Appendix C: Ivax Time 1 Questionnaire

This questionnaire was the same as Appendix A except for changes to some of the items in the job satisfaction and indirect attitude measures. The job satisfaction and indirect attitude measures used at Ivax are shown below.

The following statements concern how satisfied you are with different aspects of your job. Using the scale below, please circle ONE number for EACH statement.

0	1	2	3	4	5	6
Extremely dissatisfied	Very dissatisfied	Quite dissatisfied	Neither satisfied nor dissatisfied	Quite satisfied	Very satisfied	Extremely satisfied

The physical working conditions	0	1	2	3	4	5	6
The freedom to choose your own method of working	0	1	2	3	4	5	6
The people you work with	0	1	2	3	4	5	6
The recognition you get for good work	0	1	2	3	4	5	6
Your immediate boss	0	1	2	3	4	5	6
The amount of responsibility you are given	0	1	2	3	4	5	6
Your rate of pay	0	1	2	3	4	5	6
The opportunity to use your abilities	0	1	2	3	4	5	6
Industrial relations between management and workers in your firm	0	1	2	3	4	5	6
Your chance of promotion	0	1	2	3	4	5	6
The way your organisation is managed	0	1	2	3	4	5	6
The attention made to suggestions you make	0	1	2	3	4	5	6
Your hours of work	0	1	2	3	4	5	6
The amount of variety in your job	0	1	2	3	4	5	6
Your job security	0	1	2	3	4	5	6
The training available to you	0	1	2	3	4	5	6
Your performance at work	0	1	2	3	4	5	6
The amount of problem solving in your job	0	1	2	3	4	5	6
The amount of decision-making in your job	0	1	2	3	4	5	6
The amount of flexibility your job offers	0	1	2	3	4	5	6
The amount of team working in your job	0	1	2	3	4	5	6
The reward systems in place	0	1	2	3	4	5	6
Processes and procedures within your work area	0	1	2	3	4	5	6
The culture within your work area	0	1	2	3	4	5	6
The culture within the Waterford site	0	1	2	3	4	5	6
Your workload	0	1	2	3	4	5	6
The opportunity to give opinions about how your work is carried out	0	1	2	3	4	5	6
Considering everything, how do you feel about your job as a whole?	0	1	2	3	4	5	6

Using the scale below, please circle ONE number for EACH statement to indicate how much you feel that your adopting Lean behaviours (i.e., adopting the behaviours in Question 4) at your company in the next 6 months would lead to each of the following outcomes.

-3	-2	-1	0	1	2	3
Extremely unlikely	Quite unlikely	Slightly unlikely	Neither likely nor unlikely	Slightly likely	Quite likely	Extremely likely

Help me to work smarter	-3	-2	-1	0	1	2	3
Improve efficiency at this company	-3	-2	-1	0	1	2	3
Make this company more competitive	-3	-2	-1	0	1	2	3
Increase productivity at this company	-3	-2	-1	0	1	2	3
Improve processes at this company	-3	-2	-1	0	1	2	3
Help to reduce costs within this company	-3	-2	-1	0	1	2	3
Increase profits at this company	-3	-2	-1	0	1	2	3
Help me to save time	-3	-2	-1	0	1	2	3
Reduce the amount of work in progress	-3	-2	-1	0	1	2	3
Improve quality of products	-3	-2	-1	0	1	2	3
Increase my job satisfaction	-3	-2	-1	0	1	2	3
Increase my work motivation	-3	-2	-1	0	1	2	3
Improve communication at this company	-3	-2	-1	0	1	2	3
Make my job less frustrating	-3	-2	-1	0	1	2	3
Make my job more interesting	-3	-2	-1	0	1	2	3
Boost morale at this company	-3	-2	-1	0	1	2	3
Make my job more stressful	-3	-2	-1	0	1	2	3
Contribute to job losses at this company	-3	-2	-1	0	1	2	3
Contribute to this site closing	-3	-2	-1	0	1	2	3

Using the scale below, please indicate your evaluations of EACH of the following outcomes.

-3	-2	-1	0	1	2	3
Extremely bad	Quite bad	Slightly bad	Neither bad nor good	Slightly good	Quite good	Extremely good

Helping me to work smarter	-3	-2	-1	0	1	2	3
Improving efficiency at this company	-3	-2	-1	0	1	2	3
Making this company more competitive	-3	-2	-1	0	1	2	3
Increasing productivity at this company	-3	-2	-1	0	1	2	3
Improving processes at this company	-3	-2	-1	0	1	2	3
Helping to reduce costs within this company	-3	-2	-1	0	1	2	3
Increasing profits at this company	-3	-2	-1	0	1	2	3
Helping me to save time	-3	-2	-1	0	1	2	3
Reducing the amount of work in progress	-3	-2	-1	0	1	2	3
Improving quality of products	-3	-2	-1	0	1	2	3
Increasing my job satisfaction	-3	-2	-1	0	1	2	3
Increasing my work motivation	-3	-2	-1	0	1	2	3
Improving communication at this company	-3	-2	-1	0	1	2	3
Making my job less frustrating	-3	-2	-1	0	1	2	3
Making my job more interesting	-3	-2	-1	0	1	2	3
Boosting morale at this company	-3	-2	-1	0	1	2	3
Making my job more stressful	-3	-2	-1	0	1	2	3
Contributing to job losses at this company	-3	-2	-1	0	1	2	3
Contributing to this site closing	-3	-2	-1	0	1	2	3

Appendix D: Time 2 Questionnaire

Note that the time reference used in the Ivax questionnaire was 11 months; Arvin respondents were not asked their gender; and CU respondents were provided with an additional >65 age category.

1. Using the scale below, please circle ONE number for EACH statement to indicate the extent to which you have engaged in the following behaviours at your organisation in the past 6 months.

0	1	2	3	4
Not at all	Just a little	A reasonable amount	Quite a lot	A great deal

Rotated jobs and tasks with your colleagues	0	1	2	3	4
Trained colleagues	0	1	2	3	4
Decided how to go about getting your job done	0	1	2	3	4
Planned your own work	0	1	2	3	4
Used a variety of skills and abilities in your job	0	1	2	3	4
Used your initiative in your job	0	1	2	3	4
Taken part in decisions that are likely to affect you in your job	0	1	2	3	4
Taken part in activities aimed at improving the working of your section	0	1	2	3	4
Decided on the order in which you do things	0	1	2	3	4
Analysed a long-term problem to find a solution	0	1	2	3	4
Suggested new ways of working in your work area	0	1	2	3	4
Made suggestions to management about ways to improve the working of your section	0	1	2	3	4
Contributed to discussions about your company's strategy	0	1	2	3	4
Helped to set targets/goals in your work area	0	1	2	3	4
Visited people from other departments to suggest doing things differently	0	1	2	3	4
Worked as part of a team	0	1	2	3	4
Kept your work area neat, tidy and safe	0	1	2	3	4
Represented your work area in meetings with senior management	0	1	2	3	4
Designed new procedures for your work area	0	1	2	3	4
Presented information to a group of colleagues	0	1	2	3	4

2. How long have you worked here? _____Years

3. Gender: Male □ Female □

4. Age: 16-25 □ 26-35 □ 36-45 □ 46-55 □ 56-65 □

5. Did you complete a questionnaire concerning Lean behaviours 6 months ago?

   Yes □ No □

6. If you answered yes to question 5, please state the password you provided on the questionnaire you completed 6 months ago. Otherwise write NA_____

Thank you for completing this questionnaire

Appendix E: Arvin Time 1 Questionnaire

This questionnaire was the same as Appendix A except for changes to some of the items in the job satisfaction and indirect attitude measures. The job satisfaction and indirect attitude measures used at Arvin are shown below. Arvin respondents were not asked to state whether they occupied a managerial position or their gender as all target respondents were non-managers and male.

The following statements concern how satisfied you are with different aspects of your job. Using the scale below, please circle ONE number for EACH statement.

0	1	2	3	4	5	6
Extremely dissatisfied	Very dissatisfied	Quite dissatisfied	Neither satisfied nor dissatisfied	Quite satisfied	Very satisfied	Extremely satisfied

The physical working conditions	0	1	2	3	4	5	6
The freedom to choose your own method of working	0	1	2	3	4	5	6
The people you work with	0	1	2	3	4	5	6
The recognition you get for good work	0	1	2	3	4	5	6
Your immediate boss	0	1	2	3	4	5	6
The amount of responsibility you are given	0	1	2	3	4	5	6
Your rate of pay	0	1	2	3	4	5	6
The opportunity to use your abilities	0	1	2	3	4	5	6
Industrial relations between management and workers in your firm	0	1	2	3	4	5	6
Your chance of promotion	0	1	2	3	4	5	6
The way your organisation is managed	0	1	2	3	4	5	6
The attention made to suggestions you make	0	1	2	3	4	5	6
Your hours of work	0	1	2	3	4	5	6
The amount of variety in your job	0	1	2	3	4	5	6
Your job security	0	1	2	3	4	5	6
The amount of problem-solving in your job	0	1	2	3	4	5	6
The opportunity to take on different roles and responsibilities in Arvin	0	1	2	3	4	5	6
The amount of technical/practical elements to your job	0	1	2	3	4	5	6
The opportunity to learn and develop new skills	0	1	2	3	4	5	6
Your workload	0	1	2	3	4	5	6
Your performance at work	0	1	2	3	4	5	6
The opportunity to give opinions about how your work is carried out	0	1	2	3	4	5	6
Considering everything, how do you feel about your job as a whole?	0	1	2	3	4	5	6

Using the scale below, please circle ONE number for EACH statement to indicate how much you feel that your adopting Lean behaviours (i.e., adopting the behaviours in Question 4) at your company in the next 6 months would lead to each of the following outcomes.

-3	-2	-1	0	1	2	3
Extremely unlikely	Quite unlikely	Slightly unlikely	Neither likely nor unlikely	Slightly likely	Quite likely	Extremely likely

Help Arvin save time and money	-3	-2	-1	0	1	2	3
Help me to work more efficiently	-3	-2	-1	0	1	2	3
Increase profits at Arvin	-3	-2	-1	0	1	2	3
Improve my work performance	-3	-2	-1	0	1	2	3
Improve processes at Arvin	-3	-2	-1	0	1	2	3
Increase productivity at Arvin	-3	-2	-1	0	1	2	3
Improve quality of Arvin products	-3	-2	-1	0	1	2	3
Make my job more stressful	-3	-2	-1	0	1	2	3
Increase my workload	-3	-2	-1	0	1	2	3
Increase my work motivation	-3	-2	-1	0	1	2	3
Increase my job satisfaction	-3	-2	-1	0	1	2	3
Contribute to job losses at Arvin	-3	-2	-1	0	1	2	3
Contribute to jobs not being completed on time	-3	-2	-1	0	1	2	3
Increase the number of errors made	-3	-2	-1	0	1	2	3
Give me more time to develop new ideas	-3	-2	-1	0	1	2	3
Contribute to a decline in customer satisfaction	-3	-2	-1	0	1	2	3
Contribute to this site closing	-3	-2	-1	0	1	2	3

Using the scale below, please indicate your evaluations of EACH of the following outcomes.

-3	-2	-1	0	1	2	3
Extremely bad	Quite bad	Slightly bad	Neither bad nor good	Slightly good	Quite good	Extremely good

Helping Arvin save time and money	-3	-2	-1	0	1	2	3
Helping me to work more efficiently	-3	-2	-1	0	1	2	3
Increasing profits at Arvin	-3	-2	-1	0	1	2	3
Improving my work performance	-3	-2	-1	0	1	2	3
Improving processes at Arvin	-3	-2	-1	0	1	2	3
Increasing productivity at Arvin	-3	-2	-1	0	1	2	3
Improving quality of Arvin products	-3	-2	-1	0	1	2	3
Making my job more stressful	-3	-2	-1	0	1	2	3
Increasing my workload	-3	-2	-1	0	1	2	3
Increasing my work motivation	-3	-2	-1	0	1	2	3
Increasing my job satisfaction	-3	-2	-1	0	1	2	3
Contributing to job losses at Arvin	-3	-2	-1	0	1	2	3
Contributing to jobs not being completed on time	-3	-2	-1	0	1	2	3
Increasing the number of errors made	-3	-2	-1	0	1	2	3
Giving me more time to develop new ideas	-3	-2	-1	0	1	2	3
Contributing to a decline in customer satisfaction	-3	-2	-1	0	1	2	3
Contributing to this site closing	-3	-2	-1	0	1	2	3

Appendix F: Lean University Article

Creating the "Lean University"

Cardiff University aims to be recognised as one of the top 50 world leading universities by 2020. To help create the momentum to secure and sustain this vision "lean principles" are being adopted across the university.

Lean is a business philosophy that focuses on increasing "value" for the end customer and eliminating waste from business practices. So the challenge for all working at the University is to understand what is it their "customers" really want, and to ensure delivery of that happens in the most effective and efficient way. Such a philosophy needs to be embedded throughout an organisation if it is to be successful - from strategy formation through to individuals continually looking for opportunities to improve the way they work. Fundamentally, it is about ensuring that your day is spent focussing on the core value adding activities of your job rather than the tedious chasing of missing information, the duplication of work, the expending of effort in trying to figure out who should be sent what etc. Lean offers up a number of tools and techniques that can help individuals and teams achieve this but, more than that, it is very much about a way of thinking that will help lighten our individual and collective loads.

Cardiff University is leading the way on employing "Lean Thinking" in a higher education environment and therefore the first year of this programme is very much about learning and understanding how Lean can and should be applied in a university. A number of pilot areas will be developed in this first year in order to gain that understanding and knowledge and to ensure not only initial success but also long term sustainability.

A new "Lean Team" is being put in place in the Strategic Development Division to oversee implementation and provide guidance. This core team will work closely with the Lean Enterprise Research Centre (LERC) in Cardiff Business School drawing on their extensive experience of deploying lean in various environments. The goal will be to ensure that "Lean Principles" are adopted across the University in such a way that it helps create the environment where staff feel able to act and innovate. Further updates on progress will appear in Cardiff News and a Lean University website will be created to provide more detail on Lean and its deployment.

Appendix G: Cover Letter for CU Time 1 Questionnaire

Dear Colleague,

Lean University is a university-wide initiative led by the Strategy Division. The University is interested in employee expectations and opinions about the initiative to help ensure appropriate communication and training/awareness sessions are delivered to staff. Although we recognize that many of you may have little knowledge of Lean or the Lean University initiative, we are still interested in your thoughts and opinions.

We have randomly selected staff from across the University to receive this email. We would be very grateful if you could spare **a few minutes** to complete a questionnaire, which can be found at http://www.surveys.cardiff.ac.uk/cutime1/ For most of the questions, you simply have to tick a box so it is quick and easy to complete. All replies will be treated in the strictest confidence and data will only be reported in an aggregated form. Although your participation is voluntary, we do hope that you will take the time to give us your views as they are important to us. Please be advised that, by completing the questionnaire, you are agreeing for us to use your responses.

The closing date for completed questionnaires is 2nd April 2007.

If you have any questions about the questionnaire, please email sbsl@cardiff.ac.uk.

Many thanks in advance for your cooperation

Kind regards

Christine Stewart
Lean University Project Leader

Appendix H: Email Sent to CU School Managers

Dear Colleague,

A short time ago you attended a Lean Awareness session as part of the School Managers Forum. I hope you found this both useful and informative.

During this session a number of concerns were raised regarding staff perceptions of Lean and the benefits it can bring to the University. In order to address these concerns effectively, we would like to issue a questionnaire to a number of randomly selected staff across the organisation to gain an insight into their expectations of, and attitudes towards, lean.

The feedback from this will be used by the Lean University Team to target communication, training and awareness sessions in the most appropriate way.

I would appreciate it if you could advise your staff that this questionnaire is being issued and to emphasise the importance of completion. The questionnaire will be sent as a web link via email from sbsl@groupwise.cf.ac.uk

I would like to thank you for your help with this. If you have any questions or concerns then please do not hesitate to contact me prior to the issue date of the 12th March 2007.

Many thanks in advance for your cooperation

Kind regards

Christine Stewart
Lean University Project Leader

Appendix I: Email Sent to Heads of Directorates

Dear Colleague,

As you are aware the Lean University Project is focussing on three main projects for this year. Those staff involved in these projects will be provided with the appropriate training and guidance in the principles of Lean. However there will be a number of staff members who will not be directly involved and it is essential that they receive appropriate communication such that they stay informed.

In order to make sure that the most appropriate communication, training and awareness is provided, we will be issuing a questionnaire to a number of randomly selected staff across the University to gain an insight into their expectations of, and attitudes towards, lean.

I would appreciate if you could advise your staff that they may receive this and emphasise how important it is that they complete and return it. The questionnaire will be sent as a web link via email from sbsl@groupwise.cf.ac.uk

I would like to thank you for your help with this. If you have any questions or concerns then please do not hesitate to contact me prior to the issue date of the 12th March 2007.

Many thanks in advance for your cooperation

Kind regards

Christine Stewart
Lean University Project Leader

Appendix J: Reminder Email for CU Time 1 Questionnaire

Dear Colleague,

Many thanks to those of you who have completed the Lean University questionnaire. For those of you who haven't, we would greatly appreciate if you could spare **a few minutes** to do so. Most of the questions simply require you to tick a box so it is quick and easy to complete. All replies will be treated in the **strictest confidence** and data will only be reported in an aggregated form. Although your participation is voluntary, we do hope that you will take the time to give us your views. They are important to us and will be fed into future communication and training/awareness sessions about the Lean University initiative. I would like to reiterate that we still welcome your opinions even if you feel that you have little knowledge of Lean or the Lean University initiative.

The questionnaire can be accessed at http://www.surveys.cardiff.ac.uk/cutime1/

The closing date for completed questionnaires is 2nd April 2007.

If you have any questions about the questionnaire, please email sbsl@cardiff.ac.uk.

Many thanks in advance for your cooperation

Kind regards

Christine Stewart
Lean University Project Leader

Appendix K: Cover Letter for CU Time 2 Questionnaire

Dear Colleague,

Many thanks once again for taking the time some six months ago to complete a survey about your attitudes towards the Lean University initiative.

The Lean University Team has delivered a number of training and awareness sessions to staff across the University in the past six months. The University is keen to see whether these training/awareness sessions have had any impact on people's ways of working.

We would be grateful if you could spare a **few minutes** to complete an online survey which can be found at http://www.surveys.cardiff.ac.uk/cutime2/

Although we recognise that some of you may have little knowledge of the Lean University initiative or may not have received any Lean training in the past six months, we are still interested in your responses.

Please note that all replies will be treated in the **strictest confidence** and data will only be reported in an aggregated form. Although your participation is voluntary, we do hope that you will take the time to give us your views as they are important to us. Please be advised that, by completing the questionnaire, you are agreeing for us to use your responses.

The closing date for completed questionnaires is 3rd October 2007.

If you have any questions, please email sbsl@cardiff.ac.uk.
Many thanks in advance for your cooperation

Kind regards

Christine Stewart
Lean University Project Leader

Appendix L: Reminder Email for CU Time 2 Questionnaire

Dear Colleague,

Many thanks to those of you who have completed the Lean University questionnaire for a second time. For those of you who haven't, we would greatly appreciate if you could spare a few minutes to do so. The questionnaire can be accessed at http://www.surveys.cardiff.ac.uk/cutime2/ Most of the questions simply require you to tick a box so it is quick and easy to complete. All replies will be treated in the strictest confidence and data will only be reported in an aggregated form. Although your participation is voluntary, we do hope that you will take the time to give us your views because they are important to us. The Lean University Team has delivered a number of training and awareness sessions to staff across the University in the past six months and the University is keen to see whether these sessions have had any impact on people's ways of working.

I would like to reiterate that we still welcome your opinions even if you feel that you have little knowledge of the Lean University initiative or have not received any Lean training in the past six months.

The closing date for completed questionnaires is 3rd October 2007.

If you have any questions, please email sbsl@cardiff.ac.uk.

Many thanks in advance for your cooperation

Kind regards

Christine Stewart
Lean University Project Leader